

DE GRUYTER

Nicola Reggiani

DIGITAL PAPYROLOGY I

METHODS, TOOLS AND TRENDS

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Acknowledgments

I owe my first acquaintance with Digital Papyrology to Professor Isabella Andorlini, who admittedly has been a pioneer in the systematic application of electronic resources to papyrological scholarship, from the effective use of textual databases to virtual restoration of fragmentary documents¹, up to the digitization of the Greek medical papyri². I still remember her passion in describing functionalities and advantages of the digital tools, and her skilfulness in using them. My previous interests in information technologies did the rest³. I would like to dedicate this work to Her, in memory of all this.

My grateful thoughts then go to Fabian Reiter, who allowed me to hold a class of Digital Papyrology at the University of Trier during the Winter Semester 2016/17, which gave me really many useful and interesting suggestions about the topics discussed here. He also supported this publication, for which I wish to thank also Mirko Vonderstein and my other contact people at De Gruyter (Katrin Hofmann, Florian Ruppenstein), who have been so kind, patient and efficient in following all the publishing steps. I am grateful also to the students who actively took part into the Trier seminar (Julius Bergau, Spyridoula Bounta, Pia Geißel, Sara Marmai) for all the fruitful discussions we had together.

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I wish this thank-list were longer, because I would have loved to discuss all the topics and resources with more people. Unfortunately, unpredictable tragic circumstances slightly affected the conclusion of the ERC DIGMEDTEXT project, from which this work stems (see Appendix 2), and bureaucratic demands forced me to complete the publication in too short a time. I hope that my benevolent readers will take what follows for what it is – a preliminary survey and a tentative theoretical, methodological, and epistemological arrangement of a rising and ever-changing subject, probably presented in too an Italianized English, for which I express all my sorrowful apologies – and will kindly agree to send me back advice, suggestions, remarks, criticism, so that a sharper manual can be envisaged in the near

future of Digital Papyrology⁴.

The present work is not exactly a handbook – most of the digital tools do already offer detailed instructions and help guides, to which I gladly refer –, nor just a list of tools. Recent detailed surveys of the digital papyrological scenario already exist⁵ and they do not deserve to be updated or replaced. My aim is to analyse the electronic papyrological resources in details in order to pinpoint common trends, to sketch methodological outlines and to envisage an epistemology of Digital Papyrology, in view of the possible future developments⁶.



Isabella Andorlini and Nicola Reggiani at the SoSOL Training Session,
Duke University (Durham, NC), July 2010.

Table of Contents

1Tablets of the Mind (An Introduction)

1.1Papyrology in the Digital Vanguard

1.2Issues in Digital Papyrology

2Digital Bibliographies and Bibliographical Standards

2.1*Bibliographie Papyrologique*

2.2*Trismegistos* Bibliographies

2.3The *Checklist of Editions*

2.4A Flock without a Shepherd (On Bibliographical Standards)

2.5Special Bibliographies

3Cataloguing Metadata

3.1The *Heidelberger Gesamtverzeichnis*

3.2The Literary Catalogues: *Mertens-Pack*³ and the *Leuven Database of Ancient Books*

3.3Thrice Greatest *Trismegistos*

3.4Fifty Shades of Papyri, or: What Do We Catalogue?

3.5Extant, Would-Be, and Passed Away Digital Thematic Catalogues

3.6Digital Catalogues of Papyrological Collections

3.7Envisaging Virtual *Corpora* of Papyri

4Indexing Words

4.1*Wörterlisten*

4.2General Dictionaries / Glossaries

4.3Thematic Dictionaries / Glossaries (Lexica)

4.4Prosopographies and Onomastica

4.5Indexes of Emendations

5Virtual Papyrology

5.1Imaging Papyri Digitally for Preserving and Reading

5.2Reading Invisible Ink

5.3Virtual Restorations and Reunifications

5.4Digital Palaeography

5.5How Virtual Papyrology Redesigns Papyrology

6Papyrological Mass Media

6.1Websites of Institutions (Associations, Research Centres, Collections)

- 6.2Papyrological P.R.
- 6.3Thematic Highlights and Online Exhibitions
- 6.4Staying Papyrologically Digitally Tuned
- 6.5Good and Bad Digital Practices: Overcoming Cultural Boundaries and Purchasing Papyri Online
- 6.6Digital Publications

7New Trends in Digital Papyrology

- 7.1Quantitative Analysis of Textual Data: Past and Future of Computational Linguistics Applied to Papyrology
- 7.2Quantitative Analysis of Metadata: Social Network Analysis in Papyrology
- 7.3Integrated Scholarly Workspaces

8From Textual Databases to Digital Scholarship

- 8.1Digital Encoding of Papyrus Texts: Theory and Practice
- 8.2The Earliest Textual Databases
- 8.3The *Thesaurus Linguae Graecae* and the *Duke Databank of Documentary Papyri*
- 8.4The *Papyrological Navigator*
- 8.5The *Papyrological Editor*
- 8.6From Digital Editions to Digital Scholarship
- 8.7New Standards for Digital Literary Papyri

9The Shape of Things to Come (Not A Conclusion)

Appendix 1. Clarysse's software

Appendix 2. The DIGMEDTEXT Project

Bibliography

Indices

- I.Individuals and Institutions
- II.Digital Resources
- III.*Conspectus Siglorum*
- IV.General Keywords

cognitive ‘technologies’ that have been analysed – in relation with men’s knowledge and memory – in Jocelyn P. Small’s monograph⁸ titled after the phrase with which the ancient Greeks metaphorically used to call memory, i.e. “tablets of the mind”, *φρενῶν δέλτοι*⁹. Small’s essay shows that the problem of the relationship between creating information material (‘data’) and the ways of accessing it is definitely ancient, and that the transition from human ‘memory’ – the very first tool for storing and retrieving information! – to artificial intelligence is just a technological and chronological swerve, not a conceptual one – after all, it is not by chance if we still speak of electronic *memory* devices.

Human memory – the Mother of the Muses – is the business of the humanist. The scholar works to preserve for the future an intimate connection between what Wordsworth called ‘the noble living and the noble dead.’ As with the renaissance sped forward by the printing revolution of the fifteenth century, digital technology is driving a radical shift in humanities scholarship and education¹⁰.

For this reasons, informatics is topical in the field of the Humanities.

Offering a complete overview of the issues entailed by Digital Humanities today is definitely arduous in this introductory place, and not strictly relevant here. Definitions are difficult too: saying that Digital Humanities is “concerned with the applications of computing to research and teaching within subjects that are loosely defined as ‘the humanities’”¹¹ would imply long discussion of what is ‘the Humanities’; it is therefore better to refer to a significant selection of the very wide bibliography on the matter for further reference¹². The same embarrassment arises when trying to introduce Digital Classics, that is “the use of digital technologies in any field related to the study of classical antiquity”¹³. Yet this is not a secondary issue. As it has already been noticed almost twenty years ago, “it would not be immediately apparent that the discipline of classics (in many people’s minds, I suspect, the province of conservative, myopic, and nonprogressive minds), should be in the vanguard of academic innovations in cyberspace. Yet such is the case”¹⁴. Or, in Greg Crane’s sharper and more recent words, “many non-classicists from academia and beyond still express surprise that classicists have been aggressively integrating computerized tools into their field for a generation”¹⁵.

1.1 Papyrology in the Digital Vanguard

Within this digital framework, Papyrology – “a discipline concerned with the recovery and exploitation of ancient [everyday] artifacts bearing writing and of the textual material preserved on such artifacts”, with chronological boundaries usually placed between the Hellenistic and the Arab periods, especially – but not only – in Egypt¹⁶ – has always been in the vanguard. The

first experiments to apply the newborn computational methods to papyrological research date back to the Sixties (see below, §§ 3.5, 7.1, 8.2), and as early as 1968 an entire session, with six papers!, on “Computer uses in Papyrology” was scheduled at the 12th International Congress at Ann Arbor, after the establishment by the Association Internationale de Papyrologues of a special study commission on the computerized work applied to Papyrology¹⁷. Since 1965, there has been no international papyrological congress without at least one paper connected to digital matters. It is an ideal situation that does not elude the same scholars of the field¹⁸. There are multiple reasons for this.

The first and foremost reason is epistemological. Papyrology is grounded on instances of *comparison* and *discussion*¹⁹: (a) of material fragments – constantly increasing in number and very often scattered among different, geographically distant collections – with the purpose of reconstructing the documents; (b) of texts, aimed at transcribing and interpreting their content, from both the palaeographical and the philological/textual points of view (identification of parallel passages, formulas, documentary typologies, handwriting, etc.); (c) of miscellaneous and complex data for contextualising the studied document – from the historical, cultural, social, economic, scientific, religious, technological... viewpoints²⁰; (d) last but not least: among scholars, in the name of that fruitful international collaboration under the auspices of which Papyrology moves, and which is traditionally and effectively called *amicitia papyrologorum*²¹.

Comparing and discussing imply, on one hand, circulation of the relevant data, and, on the other hand, their availability, in terms of both sharing and accessibility:

the challenge facing the scholarly community as a whole will be to work together as much as possible, to avoid any expensive duplication of work, and to try to integrate data from as many different sources as possible, while keeping in mind that each resource has to survive its own creator, to meet the demands of its own public and to overcome specific difficulties²².

In both cases, the potential and the immediacy provided by the digital tools – namely those web-based – offer themselves as the best solution to support the work of the papyrologist as an “artificer of facts”, discoverer and provider of data²³, mastering a discipline that is always – in Ann Hanson’s words – “in flux”²⁴.

A second reason is methodological. Papyrological methodology is not easy to outline – there is traditionally a philological approach, which tends to define protocols for text editing and criticism²⁵, and a historical one, concerning “the theory and method of using [...] the papyri in the writing of history”²⁶. Generally speaking,

Papyrology has tended to be one of the most resolutely technical and positivistic

disciplines of antiquity. This characteristic has justifiable roots in the enormous investment of time and expertise, in palaeography and philology, that is necessary for reading and interpreting the texts, often preserved only fragmentarily and in difficult handwritings²⁷.

The epistemological foundations of the discipline depend on thorough methodology, and method needs to be organized²⁸. It is intriguing to note that the very thirty years preceding the ‘outbreak’ of Digital Papyrology in the mid Sixties underwent a systematic insistence on organization issues (“problemi di organizzazione”), forwarded mainly by the outstanding Italian scholars Aristide Calderini and Orsolina Montevocchi.

It is not pedantic to resume their claims here because not only are they very topical still today, but also they actually seem a true methodological foundation for what would have become Digital Papyrology and its main resources, since it is in the advantages of the electronic tools that Papyrology finds the best way of dealing with its baseline issue, i.e. coping with an overwhelming amount of data²⁹. In Calderini’s view, “la sistemazione generale e particolare del materiale con lo scopo di ottenere il massimo possibile rendimento” would have to comply with the following points³⁰:

- 1)a standard method of editing papyri (he praises the establishment of the Leiden editorial conventions³¹) so that it is possible to reach a general uniformity and an ideal unity, which would prelude to
- 2)a unique and common *Corpus* of all the papyri;
- 3)as a preparation of the *Corpus*, a general directory or catalogue of documentary papyri, in the wake of the existing literary catalogues (e.g. Pack’s)³²;
- 4)a widespread and systematic presence of facsimile reproductions of published papyri, in order to identify dispersed fragments, to better preserve the artefacts, to easily check the texts³³;
- 5)a general standardization of the ‘titles’ of the editions, i.e. a definition of standard textual typologies, in order to categorize the texts in a common and uniform fashion;
- 6)a general standardization of papyrological abbreviations (he notes considerable inconsistencies in the *sigla* of text editions or *corpora*³⁴);
- 7)an effective management of bibliographical information (on this point, Calderini was in fact confident in the forthcoming *Bibliographie papyrologique*, see below, § 2.1);
- 8)an effective management of corrections, revisions, and re-editions, by means of a centralized coordination³⁵;
- 9)an effective redaction of reference dictionaries, with a special focus on “una specie di dizionario perpetuo dei vocaboli dei papiri, come un *Thesaurus linguae papyrorum graecae*”;
- 10)an effective dissemination of the papyrological science, among both scholars of different disciplines and the wider public;
- 11)an effective consideration of the broader historical, social, economic, etc.

We will see that the development of Digital Papyrology runs precisely along these visionary methodological points, which have never been completely fulfilled by paper instruments that are necessarily slow in collecting and providing the needed information (see below, § 9). It is not by chance, after all, that the aforementioned 1968 AIP special commission on the electronic techniques established some general recommendations for publishing papyri in a standard format, because “pour l’automatisation de l’information en papyrologie, de telles règles permettront un usage plus rationnel et beaucoup moins coûteux des moyens mis à notre disposition” and, apropos of index formatting, “[c]ette normalisation simplifiera certaines recherches et facilitera ultérieurement la constitution d’un dictionnaire automatique”. Such recommendations are still available from the AIP website³⁷.

Thirdly: in its peculiar interest in the written media and their transformation over time, Papyrology is always particularly sensitive to information technologies. Apart from fashionable conspiracy theories that stress the similarities between ancient representations of tablet codices and modern laptops³⁸, “there are real parallels between the appearance of the codex form and computerized forms of literary texts”, and since “cyberspace goes far beyond the codex in allowing for non-linear, not to say interactive, reading of texts”³⁹, the particular attention of papyrologists to the development of textual data cannot but be increased by and in the challenges raised by the new technological infrastructures.



As in ancient times, when papyrus rolls were used to contain not only lengthy pieces of literature but also extensive registers such as tax lists, modern-age computers facilitate

similar objectives, enhanced by powerful and sophisticated search engines. The affinity in the concept of papyrus rolls and modern-age computers is so close that even today when materials are reviewed on the screen, the term ‘scroll’ is used. Although the two media differ radically in capacity and performance values, they do originate from the same concept and desire⁴⁰.

It is interesting to observe, from this viewpoint, the publication of a contribution by Willy Clarysse and Katelijn Vandorpe about ancient writing, book production, and literacy as “information technologies” in *The Oxford Handbook of Engineering and Technology in the Classical World*⁴¹. On the other side, information technologists sometimes look at the papyri as the ancestors of digital data storage: it is striking that the proceedings of a conference held by *Microsoft* on occasion of the diffusion of the CD-ROM support were titled *The New Papyrus*⁴².

From a parallel, but opposite perspective, ‘papyrus’ and its conceptual world do not fail to influence the laymen’s collective unconscious, becoming a preferential brand for writing-related firms – especially stationery shops, photocopy shops, publishing houses, paper factories, and so on⁴³ –, and eventually for electronic writing-related products. Thus we find that with *papyrus* – limiting ourselves to the most outstanding hits of a research conducted *exempli gratia* – people identify a graphical modelling software, the icon of which is – *ça va sans dire* – a stylization of Thot, the ancient Egyptian scribe-god; a font; an application for hand-written annotations, the meaningful icon of which is a papyrus roll, with the motto “beyond paper” (see picture below); a “bibliography system and knowledge manager”; a communication platform; even a videogame developer, now closed⁴⁴.



1.2 Issues in Digital Papyrology

Digital Papyrology can be defined as the whole set of electronic resources and methodologies aimed at creating, storing, accessing, processing, and publishing information pertaining to research and study in the various fields of interest of the papyrological discipline. The information dealt with by Digital Papyrology is the papyrological data, and is composed by a complex interplay of the papyrus as a material artefact, the text is its linguistic and graphical features, and everything making up the environment of speech, the so-called context: chronology, archaeology, culture, scholarly bibliography,

and so on⁴⁵. A narrower concept of papyrological data may refer to the sole linguistic information, the very text written on the papyrus (after all, “[w]orking with papyri is above all a matter of texts”⁴⁶). Thus, we may distinguish between databases as platforms storing and processing papyrological textual information and catalogues as platforms storing and processing papyrological contextual (or descriptive) information, what is commonly called metadata, i.e. ‘data describing data’⁴⁷. A special place in this interplay is reserved to the materiality of the papyrus as an artefact, physical container of data. The digital treatment of the papyrus as a material product is twofold. On one hand, it encompasses all the electronic technologies aimed at extracting and processing information from the material papyrus itself (imaging, analysis, etc.). On the other hand, it involves the creation of a virtual *avatar* of the artefact, i.e. its digital picture, which allows further developments such as virtual palaeography and virtual restorations.

A great deal of theoretical and practical tools has been accumulated, improved, and fine-tuned in more than fifty years of experimentation and use, and Digital Papyrology has now come to a turning point. On one hand, enhancements and developments are so quick and extensive that they make it necessary to trace a state of the art, as complete as possible⁴⁸. This, in turn, could provide a strong methodological and epistemological foundation to the new trends that are standing out closer and closer on the horizon, eventually flowing into the great utopia of the digital edition of the papyri⁴⁹. The increasing debate, interest, and discussion about digital tools makes one think that the 21st century may really be regarded as the ‘century of Digital Papyrology’⁵⁰. Of course, this poses several methodological and epistemological questions, mainly related to the possible configuration of Digital Papyrology as a special discipline itself, not just a *Hilfsmittel* aimed only at speeding up and facilitating papyrological research. I will verify this assumption in the following chapters, and will offer some final thoughts in the conclusions.

Since its origins, Digital Papyrology has followed an overall trend, which can be perceived very well everywhere, in the past as well as in the currently existing instruments and platforms. It is the transition – encouraged by the parallel developments in hardware and software technologies – of the main reference tools from paper to electronic supports, “von der Lochkarte zur CD-ROM”⁵¹, and thence to the Internet⁵². Despite some secondary issues, embedded in the very mechanics of the Web (server functionalities, multi-user support, bandwidth limits, etc.), this has invaluablely increased the potentials of open access and collaborative participation that were already envisaged by James O’Donnell as

the increased capabilities for collective scholarly advance as collaborative, cumulative dialectic, as work-in-progress susceptible of ongoing sophistication and improvement. He argues that with this will come the end of the fixity of the monologic, authoritative published word [...], and perhaps also of the book and the author as we know them⁵³.

We will come back to these points later on: for now, it seems just worth commenting that this looks like the most perfect fulfilment of the ideal of *amicitia papyrologorum* as sketched above, in that it significantly improves the fundamental practices of international communication and collaboration, in terms of sharing and accessibility⁵⁴. We can consider the 20th International Congress of Papyrology, held in Copenhagen in 1992 (Internet was born just the year before) as the main turning point: the second entirely computer-focused panel scheduled since the Ann Arbor 1968 congress outlined a new generation of papyrological digital resources (TLG and DDbDP on CD-ROM, HGV, APIS, Willy Clarysse's software, and not only) that would provide the very basis for all subsequent web-based developments of the discipline⁵⁵.

Integration is a further, powerful outcome of this digital shift. The transfer of paper and offline digital resources to the Web makes it possible to access several different tools at the same time; to have them available in the same place is its unavoidable consequence. As we will see later on, *Integrating Digital Papyrology* (IDP) has been the major digital papyrological project in the latest years succeeding in aggregating the main papyrological resources (textual databases, metadata catalogues, and digital pictures) in one, powerful platform⁵⁶. The interrelation of the digital practices has produced another important opportunity, not yet exploited in its entirety but nonetheless full of valuable promises: standardization. The application of computational logic, with its formalized languages, regular routines, and inescapable rules, to papyrological data, brings an outstanding potential for putting order into the chaos of the virtually infinite idiosyncrasies that populate the papyrological world, and that were already deprecated by Calderini, as well as by Eric Turner⁵⁷. Individual or traditional practices, as well as more or less voluntary ambiguities could be strongly reduced, if not completely avoided, by adopting universal formal standards for managing and processing data. This, unfortunately, is often not the case even with Digital Papyrology, as we will point out later on. Nevertheless, the possibility does exist⁵⁸.

I will not take into consideration the multifaceted impact that electronic resources produce on their final users, papyrologists, and papyrological research. This is indeed the main subject of the PhD project *Digital Humanities in Papyrology* that is being conducted by Lucia Vannini at the Institute of Classical Studies, School of Advanced Studies, London, under the supervision of Gabriel Bodard and Nikolaos Gonis⁵⁹. In investigating the application of digital methods to Papyrology, and how digital approaches have influenced papyrological research practices, it is a very interesting complement to my own perspective, and I certainly refer to it as concerns this topic. However, a key concern, which has deep implications in the methodological and epistemological considerations about Digital Papyrology, deserves a particular mention. There is apparently a sort of technological (traditional?) divide between who tends to underestimate the contribution of the digital resources, thus relegating them to the rank of secondary, even

optional tools, if not refusing to rely on and trust in them at all, and who, on the contrary, tends to overestimate it, regarding Digital Papyrology as the ultimate source of information. We will address this issue more precisely further on (below, § 9), but it is important to claim an effective piece of advice immediately: *in medio* – not in ‘media’! – *stat virtus*!

2Digital Bibliographies and Bibliographical Standards

Without tradition, art is a flock of sheep without a shepherd.
Without innovation, it is a corpse.

Winston Churchill

Bibliographies, i.e. lists of publications, contain references to primary or secondary literature, which falls into the digital category of metadata described above (§ 1.2). Bibliographies are in fact metadata catalogues themselves. In the papyrological field we may distinguish between general bibliographies (basically, the *Bibliographie Papyrologique*), special bibliographies (bibliographical repertories devoted to particular themes), individual bibliographies (bibliographic references to single papyri), and checklists (catalogues of reference works and edition volumes, of which they usually provide the ‘official’ abbreviations). As we will see, standardization is the real sore point for bibliographical resources, due to different traditions and needs – the lowest common denominator can indeed be provided just by Digital Papyrology.

2.1 *Bibliographie Papyrologique*

The most complete and comprehensive bibliographical resource in Papyrology is the *Bibliographie Papyrologique* (BP), “une bibliographie générale de la papyrologie grecque depuis ses origines”, following the definition provided by its own founder, Marcel Hombert, in 1932. The scientific range and the practical effort of such a project are easily imaginable, and the same Hombert presented their outlines during a talk delivered at the second International Congress of Papyrology (Leiden 1931), then published on *Chronique d’Egypte* one year later⁶⁰. Its details, though being of huge interest from the point of view of both the history of the discipline and the bibliographical sciences, fall outside the purposes of the present pages. I just recall that the project was designed into two different stages: the production of a retrospective bibliographical inventory of what had been published until then and the redaction of a current bibliographical resource, on cardboard sheets, aimed at keeping a constantly updated overview of Papyrology-related

publications. For financial reasons, only the latter task was launched, supported by the Fondation Égyptologique Reine Élisabeth at Bruxelles and edited by the same Hombert, until 1992, later flanked and then substituted by Georges Nachtergaeel, from 1974 to 2009, and then Alain Martin, since 1984.

At a later time, a paper presented by Nachtergaeel and Roger S. Bagnall at the 15th International Congress of Papyrology (Bruxelles 1977; then published in the *Proceedings*⁶¹) represented a milestone in the history of this bibliographical resource, in that it marked the meeting point with the electronic tools. The increasing number of papyrological publications was making it increasingly complicated to manage the bulk of information, while the need for a good retrospective bibliography was still felt: in this situation, turning to the new information technologies was not avoidable any more⁶². Thus, the cardboards were digitized, in several different stages, at the Columbia University, by means of the bibliographical software *ProCite*⁶³: by 1992, 8,529 files were created, covering the publications of the years 1976–1989, collected in a series of floppy disks published by Scholars Press. In the meantime, the updates to the current bibliography continued to be circulated to subscribers, on the traditional cardboards and, as of 1995, in both A4 paper prints and a digital card-like *FileMaker Pro* database – first on floppy disks, then as electronic mail attachments.

In 2000, the Fondation Reine Élisabeth produced a CD-ROM called *Subsidia Papyrologica 1.0*, which contained 24,215 bibliographical records covering the years 1960–1999 (= “BP 60–99”), organized in a *FileMaker Pro* database and including both the files created at Columbia, converted in the new format, and more recent records. This first issue was followed by versions 2.0 (years 1932–2004 = “BP 32–04”, total 37,506 records), 3.0 (years 1932–2007 = “BP 32–07”, total 41,620 records), and 4.0, the most recent one at present, released in 2010 and edited by Alain Martin with the cooperation of Roger Bagnall, Alexandre Buchet, Annie Deknuds, Alain Delattre, Paul Heilporn, and Henri Melaerts. It contains roughly 44,000 records, covering the years 1932–2010⁶⁴. The CD-ROM includes also a database of “concordances”, listing the index numbers used to categorize the bibliographical citations, the abbreviations of papyrological⁶⁵ and epigraphical texts, the abbreviations of periodicals and journals. The query function is very simple and compliant with *FileMaker* database search options. It is possible to search for words in all the fields in which the records are arranged: indexed subject; mentioned documents, if applicable; author and title; publication details; summary of the content; possible reference to *Sammelbuch* or *Supplementum Epigraphicum Graecum*; possible critical reviews; unique numeral identifier of the record; surnames of the authors; publication year⁶⁶. These digital cards represent therefore an enhanced version of the information collected in the cardboards.

WINTER J.G. and H.C. YOUTIE. Cotton in Graeco-Roman Egypt.

American Journal of Philology 65 (1944) pp. 249-258.

Texte, commentaire et traduction de deux lettres privées du II^e s. ap. J.C. (P. Mich. Inv. 3630 et 1648) qui mentionnent expressément l'usage du coton en Egypte.

As of 2011, BP took advantage of the technological progress accomplished with the project *Integrating Digital Papyrology* (see above and below, §§ 1.2 and 8.3–4) and became part of the *Papyri.info* portal: the data from its digital records were converted in XML format and are now available and searchable through the page <http://papyri.info/bibliosearch>⁶⁷. Simple text searches are possible; in the following picture, the quick guidelines provided on the page itself are visible:

The screenshot shows the Papyri.info website interface. At the top right is a 'sign in' link. Below the header is a navigation bar with 'Browse: DDBDP HGV APIS TM Number' and 'or Search: Data Bibliography'. The main heading is 'Search Bibliography' followed by a search input field and a 'Search' button. Below this, there are three paragraphs of search guidelines. The first paragraph explains how to search anywhere within a record. The second paragraph explains how to restrict searches to specific fields and provides an example search. The third paragraph lists the fields that work with search constraints. The fourth paragraph explains that accents are ignored and wildcard searches are possible.

Papyri.info [sign in](#)

Browse: DDBDP HGV APIS TM Number or Search: Data Bibliography

Search Bibliography

To search anywhere within a record enter the word or words in the search box, e.g.: Bowman or Bowman land (space between words = 'and').

To restrict searches to specific fields enter, e.g.: author:Hombert title:bibliographie date:1932. A search title:"land lease" finds all records with the phrase "land lease" or "land-lease" in the title. A search for title:(land lease) finds all records with the the word "land" and the word "lease" in the title.

Such search constraints work with the following fields: author:, title:, date:, note:, index:, editor:, pubPlace:, original: (original = the entire original BP record).

Accents are ignored, so that etudes finds études. Wildcard searches are possible, so that ptolem* will find Ptolemy, Ptolemies, Ptolémées vel sim.

The fields indicated come from the original BP *FileMaker Pro* records. The results are listed in a series of links that point to each related record.

The following picture shows the same bibliographical entry as in the samples above. The record is divided into three main sections: "Original BP record", containing indeed the information from the original BP record,

according to the usual field arrangement but based on the new XML structure; “Provisional Papyri.info output” is a provisional HTML compact display of the record; “Mentioned Texts” lists possible references to papyri cited in the bibliographical entry, linked to the corresponding record(s) in the textual database (see below, § 8.4).

In the next pages, I reproduce the current record of the mentioned sample as it appears on the BP via *Papyri.info*, followed by its underlying TEI-compliant XML source.

Papyri.info

[sign in](#)

Browse: DDbDP HGV APIS TM Number or Search: Data Bibliography

Original BP record
Index: 141.4 364 Epistulae 757
Index bis: 141.4 P. Mich. Inv. 1648; 3630
Titre: Winter John G. and Herbert C. Youtie, Cotton in Graeco-Roman Egypt.
Publication: AJA 65 (1944) pp. 249-258.
Résumé: Deux lettres privées du IIe s. p.C. qui mentionnent expressément l'usage du coton en Égypte.
S.B. & S.E.G.: S.B. VI, 9025-9026.
C.R.: C.R. par Marcel Hombert, ChrEg 23 (1948) Nos 45-46, pp. 204-206.
No: 1944-0155

Provisional papyri.info output
38003. John G. Winter and Herbert C. Youtie, "Cotton in Graeco-Roman Egypt.," *American Journal of Archaeology*, 65 (1944). [\[xml\]](#) [\[edit\]](#)

Mentioned Texts
[SB VI 9025](#)
[SB VI 9026](#)

```

<?xml version="1.0" encoding="UTF-8"?>
<bibl xmlns="http://www.tei-c.org/ns/1.0" xml:id="b38003" type="article" sub-
type="journal">
  <title level="a" type="main">Cotton in Graeco-Roman Egypt.</title>
  <author n="1">
    <surname>Winter</surname>
    <forename>John G.</forename>
  </author>
  <author n="2">
    <forename>Herbert C.</forename>
    <surname>Youtie</surname>
  </author>
  <date>1944</date>
  <biblScope type="pp" from="249" to="258">249-258</biblScope>
  <note resp="#BP">Deux lettres privées du IIe s. p.C. qui mentionnent expressé-
ment l'usage du coton en Égypte.</note>
  <relatedItem type="appearsIn">
    <bibl>
      <ptr target="http://papyri.info/biblio/37"/>
      <!--ignore - start, i.e. SoSOL users may not edit this-->
      <title level="j" type="short-BP">AJA</title>
      <!--ignore - stop-->
    </bibl>
  </relatedItem>
  <biblScope type="issue">65</biblScope>
  <relatedItem type="mentions" n="1">
    <bibl>

```

```

<title level="s" type="short">SB</title>
<biblScope type="vol">VI</biblScope>
<biblScope type="num">9025</biblScope>
<idno type="ddb">sb;6;9025</idno>
</bibl>
</relatedItem>
<relatedItem type="mentions" n="2">
  <bibl>
    <title level="s" type="short">SB</title>
    <biblScope type="vol">VI</biblScope>
    <biblScope type="num">9026</biblScope>
    <idno type="ddb">sb;6;9026</idno>
  </bibl>
</relatedItem>
<idno type="pi">38003</idno>
<idno type="bp">1944-0155</idno>
<seg type="original" subtype="index" resp="#BP">141.4 364 Epistulae 757</seg>
<seg type="original" subtype="indexBis" resp="#BP">141.4 P. Mich. Inv. 1648;
3630 </seg>
<seg type="original" subtype="titre" resp="#BP">Winter John G. and Herbert C.
Youtie, Cotton in Graeco-Roman Egypt.</seg>
<seg type="original" subtype="publication" resp="#BP">AJA 65 (1944) pp. 249-
258.</seg>
<seg type="original" subtype="resume" resp="#BP">Deux lettres privées du IIe s.
p.C. qui mentionnent expressément l'usage du coton en Égypte.</seg>
<seg type="original" subtype="sbSeg" resp="#BP">S.B. VI, 9025-9026.</seg>
<seg type="original" subtype="cr" resp="#BP">C.R. par Marcel Hombert, ChrEg 23
(1948) Nos 45-46, pp. 204-206.</seg>
<seg type="original" subtype="nom" resp="#BP">Winter Youtie</seg>
</bibl>

```

The most striking feature of the new online version of the BP is the possibility to create new entries or edit the existing ones for any registered user of *Papyri.info*. This goes in the same collaborative direction as the whole *Papyri.info* platform (see below, § 8.5). To create a new entry, one needs to sign in the *Papyrological Editor* and then go to the “Advanced Create” page and click the button “Create New Biblio”. XML encoding is facilitated by a form-like interface, full of detailed fields that must be carefully filled in according to the bibliographical information to be encoded (picture in the next page).

Each bibliographical record is given a unique ‘publication’ identifier (‘Biblio 2017–0003’ in the example), which is not related to the record itself but to the editing instance, according to the *Papyrological Editor* custom (see below, § 8.5). It is of course possible, through the same form, to edit existing bibliographical records: once the desired record is opened on the *Papyri.info* platform, a click on the “edit” link, to be found in the “provisional output” section, will lead to the editing interface. The results, in both cases, must be saved and submitted to the editorial board.

Editing Biblio 2017-0003 from publication Biblio 2017-0003 Identifier papyri.info/biblio/2017-0003 ([View in PN](#))

+ Expand all - Collapse all

Meta Information

Type	BP and	Language	Grreek	Category	
ISBN	50	Check list			

+ save entire file

General

Article			
Journal			
Journal Short	Short Title	Style	
		Bibliographie Papyrologique	add
Book			
Book Short	Short Title	Style	
		Bibliographie Papyrologique	add
Authors	First Name	Last Name	Name
			add

+ save entire file

Editorial

Date	Editor	Issue	
Distributor			
Editors	First Name	Last Name	Name
			add
Publisher	Type	Value	
	Name		add

+ save entire file

Series

Title		Volume	
Papyrological Series:			
Title		Volume	
Series Short	Short Title	Style	
		Bibliographie Papyrologique	add

+ save entire file

Format

Pretext total	Pages total	
Page from	Page to	
Number	Items	
Column	Link	
Facsimile		
Illustrations		

Annotation	Responsibility	Annotation
		add

+ save entire file

Reference

Reedition						
Appears in	add					
Reviews list	add					
Related Articles	Series	Volume	Number	DOI	TM	no. No.
						add

+ save entire file

Edit summary (Briefly describe the changes you have made):

Save

It must be noted that for technical issues BP records available via *Papyri.info* are covered up to 2012. For a more recent and versatile online resource, one should refer to the *Bibliographie Papyrologique en ligne*, a new bibliographic databank developed by the Association Reine Élisabeth itself (http://www.aere-egke.be/BP_enligne.htm). The tool, officially announced at the International Congress of Barcelona in 2016, covers the “retrospective BP” from 1932 up to one year before the current date (53,000 records up to 2016). The records of the current year, i.e. the “current BP”, are temporarily reserved for the subscribers, who also receive five yearly updates of the offline digital BP. The search interface reproduces the *FileMaker* fields; the results are displayed in rectangles that simulate the cardboard format, and there is the possibility to print them all, or individually. The home page provides links to

the abovementioned concordances, in PDF format⁶⁸.

Bibliographie Papyrologique en ligne

Texte à rechercher dans l'ensemble des champs:

Texte à rechercher dans des champs spécifiques:

Index	
Index bis	
Titre	
Publication	
Internet	
Résumé	
S.B. & S.E.G.	
C.R.	
N°	
Nom	
Année	

The two tools only partially overlap, in terms of both coverage and functionality. For now, the BP *en ligne* is by far the most up to date, but the possibility for the users of adding new records to the BP via *Papyri.info* creates an imbalance also for the years before 2012. On the other hand, the output of the former looks more charming than the latter, and the possibility to easily print single ‘cards’ or the whole of the results is not to underestimate. However, the XML background of the latter grants great compatibility to other papyrological tools, and complies with the beneficial requirements of integration and standardization: consider the possibility to link the papyrus documents from the bibliographical record, and also to create direct links to single bibliographical records, through stable URLs like <http://papyri.info/biblio/38003>, which is not possible with the Bruxelles platform. An interconnection between the two tools would be highly recommended, also in view of the multiple functions of this bibliographical resource: archive of past publications, quick reference for bibliographical inquiries, statistical base for general reflections on papyrological studies. The latter goal, usually neglected⁶⁹, is now much favoured by the recent integration of BP data in *Trismegistos*, which allows further quantitative considerations (see below, §§ 3.3 and 7.2).

2.2 *Trismegistos* Bibliographies

Powerful bibliographical tools are indeed offered also by the *Trismegistos* platform (see below, §§ 3.3). *TM Bibliography* (*TM Bib*, <http://>

www.trismegistos.org/genbib) is an online, searchable bibliography aimed at facilitating querying in the *TM Texts* database. The main purpose of this resource is “to find more information about a specific publication or to find out which texts were published together in a particular book”⁷⁰; this means that the resource is far from being a complete and exhausting bibliography of Papyrology and related studies, as the editors themselves warn, though it covers a wide range of texts anyway, and is enriched by the recent inclusion of BP data in the *TM Editors* section⁷¹. Queries can be launched by author/editor name, title, year, journal/series of publication; the parameters can be combined with one another in the TM fashion.

Conversely, the *Demotistische Literaturübersicht* (*DemLü* or DL, <http://www.trismegistos.org/dl>) aims at completeness: it is an ongoing comprehensive bibliography of all types of publications related to the field of Demotic studies, and appears also in regular printed instalments in the journal *Enchoria* since 1971. It started from a bibliographical database collected by H.-J. Thissen (Köln University, see below, § 3.3) and is now fully searchable, by number of notice or by text strings in the fields (author/editor, title, year, journal/series, summary). Unlike *TM Bib*, DL offers also a detailed summary of the contents of each publication. Both bibliographies are linked to TM texts, and vice versa, in the worthy ideal integration of resources traditionally sought by the Leuven platform (see below, § 3.3).

2.3 The Checklist of Editions

When Georges Nachtergaele, one of the fathers of BP, reviewed the fifth edition of the *Checklist of Editions*, he noted:

On se gardera naturellement de confondre la *Checklist* avec une liste d’abréviations ! Il s’agit d’abord et avant tout [...] d’une bibliographie raisonnée de toutes les monographies, récentes et anciennes, relatives aux documents sur papyrus, parchemin, ostraca et tablettes⁷².

Few lines before, he had praised Hombert’s abbreviating methodology, founded on the principles of coherence and clarity also for non-specialists (see below, § 2.4): no surprise that he tended to attribute a wider bibliographical mission to the *Checklist*. But it was indeed the increasingly pressing need to dispose of universally standardized, comprehensible, and recognizable references that had led to the redaction of the first *Checklist of Editions of Greek Papyri and Ostraca*, edited by John F. Oates, Roger S. Bagnall, and William H. Willis, and published in the first issue of number 11 of the *Bulletin of the American Society of Papyrologists* (1974).

In fact, as one can read in its introduction, the first attempt “grew out of the efforts of Oates to assemble a working collection of papyrological material in the Papyrology and Palaeography Room in the Rare Book and Manuscript

Department of the Duke University Library” in order to avoid that the papyrological volumes be catalogued on the basis of the different publishing series of each, “burying the standard papyrological system of reference under a serial classification or even deeper in a subseries (One must admit that many an edition of papyri presents a bibliographical nightmare)”⁷³. However, there existed a wider goal:

Another, and equally important, purpose of this list is to establish a standard list of papyrological abbreviations. Such a standard list may be an ideal incapable of fulfillment, and it may seem a presumptuous undertaking on the part of a few persons to impose their standards on everyone else. Nonetheless, standardization is a highly desirable goal, and the decision to attempt it was established at a conference held at Marburg on the occasion of the XIIIth International Congress of Papyrology on August 6, 1971. Present at the meeting were Professors Eric G. Turner (London), President of the Association Internationale de Papyrologues, Jean Bingen (Brussels, Secretary-Treasurer of the international organization and editor of *Chronique d’Egypte*, Alan E. Samuel (Toronto), then Secretary of the American Society of Papyrologists and editor of the *Bulletin of the American Society of Papyrologists*, Willis, then President of the American Society of Papyrologists, and Oates. Oates had at that time already prepared a checklist of editions, and it was agreed that he should proceed to modify that list with a view to producing what would become a standard list of abbreviations and references. Shortly thereafter Bagnall joined the project. Willis, too, subsequently became an active participant⁷⁴.

Inconsistent abbreviations were indeed a long-standing pain for Papyrology, as Calderini’s early methodological outlines show⁷⁵. It is interesting to continue the reading of the introductory presentation, in order to understand the founding parameters of the *Checklist*, still at the basis of its more recent digital version; it may be noted that such a description is not that far from Hombert’s concerns for BP.

The principles that have governed our choices do not aim at a rigid consistency. Brevity and clarity have been the chief goals. Usages long sanctioned, particularly by Wilcken, have been maintained. Our preference has been to use abbreviations based on the location of the collection (*P.Mich.*), on the site where found (*P.Oxy.*) or on the name of the person whose papers constitute an archive (*P.Petaus*) wherever possible. We have arranged our list in four categories: editions of papyrological texts (e.g. *P. Teb.*), editions of ostraca (e.g. *O.Mich.*), corpora of texts of related nature (e.g. *C.Ord.Ptol.*), and series (e.g. *Pap.Lugd.Bat.*). We have made no systematic attempt to include all publications of literary papyri since they are conveniently located through R.A. Pack, *The Greek and Latin Literary Texts from Greco-Roman Egypt* (2nd ed., Ann Arbor 1965). In general, we have not listed documentary material which should find its way to publication in *SB*, although important and continuing publications (*P.Panop.* and *P.Stras.*) have been noted. We have provided some cross-references to variant abbreviations but have not attempted to scour the sources for all such. We have also noted reprinted editions as far as they are known to us⁷⁶.

Subsequently, the notable increase in papyrus editions made it necessary to produce a second edition of the list after just four years. It was printed as BASP Supplement 1 (Missoula, Montana 1978)⁷⁷, edited by Oates, Bagnall and Willis as well, with corrections, updates and supplementary information,

among which a list of editions arranged by year of publication, drawn up by Klaas A. Worp⁷⁸. Six years later, a third edition (BASP Suppl. 4, Missoula, Montana 1984), edited by Oates, Bagnall, Willis, and Worp, extended the purposes of the *Checklist* to include, for the first time, the digital resources. In the meantime, indeed, the project of the *Duke Databank of Documentary Papyri*, aimed at digitizing the whole *corpus* of the Greek documentary papyri, had launched (see below, § 8.3), and the *Checklist* immediately seemed a privileged way to have “accurate bibliographical records for the project”, and therefore it was updated and adapted “to enter it into computer-readable form”⁷⁹.

The projection towards digitization is even clearer in the *Preface* to the fourth edition of the *Checklist* (BASP Suppl. 7, Atlanta, Georgia, 1992), edited by the same Oates, Bagnall, Willis, and Worp. Now,

the third function of the *Checklist* is to provide a canon of the volumes containing documentary texts which have been or will be entered in the Duke Data Bank of Documentary Papyri, in order that a complete corpus of all published Greek and Latin documentary papyri, ostraca and tablets in machine readable form may easily be accessed, searched and concordanced by computer. Each volume already entered in the Data Bank is starred with an asterisk. Of the 440 volumes published to date, 375 are available on PHI CD ROM no. 6 issued by the Packard Humanities Institute, including all texts entered into the Data Bank up to 5 April 1991. Data entry continues, and additional volumes are being entered continuously in inverse order of their date of publication, with priority given to those published most recently. Volumes entered since 5 April 1991 are also asterisked in the *Checklist*⁸⁰.

Joining the *Checklist* to the textual database facilitated also its updates, without relying on new paper issues:

The basic data for the *Checklist* are maintained in a continually updated version at the Duke Data Bank. PHI CD ROM no. 6 contains Electronic Edition B as it stood in 5 April 1991. Electronic Edition A, revised as of 8 September 1988, was included on PHI CD ROM no. 2⁸¹.

The last paper edition, the fifth one, was published in 2001 (BASP Suppl. 9), edited by Oates, Bagnall, and Worp together with Sarah J. Clackson, Alexandra A. O’Brien, Joshua D. Sosin, and Terry G. Wilfong. The most notable innovation is the inclusion of the editions of Coptic and Demotic papyri, to which the usual standard abbreviations (with *P.* and *O.* indicating, respectively, editions of papyri and *ostraka*) were applied⁸². Meanwhile, the birth (in 1991) and development of the World Wide Web hypertext architecture (see above and below, §§ 1.1 and 9) had provided an even more dynamic and quick tool for updating and accessing data. Thus, the latest electronic *Checklist* edition on physical support (PHI CD-ROM no. 7), updated to June 30, 1996, was replaced by an online version hosted by the servers of the Duke University (Durham, NC) at the URL <http://scriptorium.lib.duke.edu/papyrus/texts/clist.html>, serving also as the bibliographical canon of the *Duke Databank*, equally moved to the Web⁸³.

Web Edition

[illegible]

[Last Updated 1 June 2011]

Editors: Joshua D. Sosin, Roger S. Bagnall

James Cowey, Mark Depauw,

Jerry G. Wiltong, and Klaas A. Worp

Founding Editors: John F. Oates and William H. Willis

PREFACE

PREFACE

NOTE TO USERS

1. PAPEY(Skip to: A | B | C | D |
E | F | G | H | I | J | K | L | M | N | O |
P | Q | R | S | T | U | V | W | X | Y |

II. OSTREA AND TABLETS

III. CONCLUSION

THE INSTRUMENT

1.0 INTRODUCTION

● 2012 年 12 月 1 日

REFERENCES

VIII LIST OF EDITIONS OF
 BOOKS, PAPERS, ETC.

DOCUMENTARY JAZZ

INTERNATIONAL

CITATIONS AND REFERENCES

The primary purpose of the *Colleen of Grein, Latin, Demotic and Coptic Papyri, Ostraca and Tablets* is to provide for the libraries a ready bibliography of all monographic volumes, both current and out-of-print, of Coptic, Latin, Demotic Coptic documentary texts on papyrus, parchment, ostraca or wood tablets. Texts published in periodicals as journal articles usually excluded, but with a number of exceptions based on the extent of the edition or the presence of full editions. One published text edition is regularly reported (but without translation or commentary) in successive volumes of *Journal of Theological Studies* (*JTS*), and another in *Journal of Egyptian Archaeology* (*JEgyptArch*). The *Journal of Egyptian Archaeology* also begins the publication of Coptic texts (*JSKopt*). Many volumes containing documentary texts publish literary and subliterary texts and such volumes are of course included, together with volumes of the same series that are exclusively literary. No systematic attempt to include all exclusively literary and subliterary volumes has been made. Supplementary material—Corpora, Index Series, etc.—has been added as seemed appropriate. We are aware that we have not achieved complete internal consistency, but, as we were in doubt, we have chosen to follow what appeared to us the most useful path rather than to stick to a rigid scheme.

The Demotic material included in this edition of the *Cheeklist* has called for fuller treatment, and we have included more information about reprints and readings than is the case for texts in the other languages. Our treatment of the Demotic owes a good deal to the work of S.P. Vleeming and A.A. den Brinker in their *Cheeklist of Demotic Text Editions and Reprints* (*CheeklistDen*, 1 (Leiden 1993)).

A second objective of the original *Checklist* was to establish a standard list of abbreviations for editions of Greek texts. This objective has been largely achieved, it is our hope that this expanded version will provide the same service for the C.D. Demotic material. We particularly advise the use of P. and O. to signify works with texts on papyrus and ostraca. We have keen as closely as possible to traditional usage in the abbreviations we have proposed.

The fifth printed edition of the *Checklist* was closed on 15 March 2001. The fourth edition, of the *Checklist* (Bulletin of the American Society of Peysopologists Supplement 7, 1992) was revised and corrected as of 20 March 1992. Preceding it in form were the third edition, closed in November 1984 (BASP Supplement 4, 1985); the second edition, closed on 30 June (BASP Supplement 1, 1978); and the first edition, published as *BASP* 11 no. 1 (1974). For an account of the origin and development of the *Checklist*, the reader is referred to the succession of Prefaces printed in the Third Edition, pp. vii-xiii. An electronic version of the *Checklist*, complete to June 30, 1996, can be found on Packard Humanities Institute CDROM.

This World Wide Web version of the Checklist is continually updated; cite as:

John F. Oates, Roger S. Bagnall, Sarah J. Clarkson, Alexandra A. O'Brien, Joshua D. Sosin, Terry G. Wilfong, and Klaus A. Worp, *Checklist of Greek, Latin, Demotic and Coptic Papyri, Ostraca and Tablets*, <http://scriptorium.lib.duke.edu/papyrus/texts/clist.html>, Month, 2000).

The *Checklist* also serves as the canon for the Duke Data Bank of Documentary Papyri. The abbreviations found in the c the DDBDP are in general those established in the *Checklist*.

Papyrological journal titles are listed in Section VI along with the abbreviations we used in referring to them. Other journals, when not given in full, are abbreviated according to the list of the *American Journal of Archaeology*, which can be found in current form at www.ajsonline.org/index.php?ptype=page&pid=8.

The possibilities offered by the web pages made it useless to update both the electronic CD-ROM edition and the paper edition of the *Checklist*: the new *Checklist of Editions of Greek, Latin, Demotic, and Coptic Papyri, Ostraca and Tablets*, edited by Sosin, Bagnall, Wilfong, Worp, along with James Cowey and Mark Depauw, was kept up to date according to the traditional arrangement (nine sections dealing with: papyri; *ostraka* and tablets; *corpora*;

instruments; series; periodicals; information on publishers; chronological list of the editions; proceedings of the international congresses; an appendix on other non-standard abbreviations), while the new hypertextual structure facilitated its use: each section corresponded to a single web page, hyperlinked through a side-bar menu on the left, with the first, longer section – the one dealing with the papyrus editions – was further articulated alphabetically (see pictures above). The hypertextual edition of the *Checklist* (now at the address <http://library.duke.edu/rubenstein/scriptorium/papyrus/texts/clist.html>; the older URL still works but redirects the users to the new one) is updated to June 1, 2011: since then, it has been joined to the *Papyri.info* platform as a result of the project *Integrating Digital Papyrology* (see above and below, §§ 1.2 and 8.4). It has therefore followed the fate of the textual database to which it had been connected for many years, and is now available at the URL <http://papyri.info/docs/checklist>, edited by Sosin, Bagnall, Cowey, Depauw, together with Rodney Ast, Alain Delattre, Robert Maxwell, and Paul Heilporn (picture below). As the new short introduction explains, the choice of the abbreviations is now open to discussion of the papyrological community, according to the collaborative trend that we already sketched in the *Introduction* and to which we will come back later on (§§ 8.5 and 9). The structural arrangement is the very same as before, though, as to now, a hypertextual arrangement that facilitate navigation as in the old Duke website is missing.

While updating seems to be a still painful issue – for example: to May 31, 2017, no reference to the *Proceedings of the 27th International Congress of Papyrology (Warsaw 2013)*, published in summer 2016, has been added yet –, the most striking fruit of the integration of the *Checklist* to the *Papyri.info* platform is the addition to each item of a hyperlink (see detail in picture below), which brings the users to the digital texts of the papyri contained in each listed edition and, when applicable, to a digital online copy of the volume itself, as in the case of the *Proceedings of the 25th International Congress of Ann Arbor* illustrated below. Both the *Checklist* and the *Bibliographie Papyrologique en ligne* (i.e. the Belgian online search engine, not the one available via *Papyri.info*) are indeed fully aware of the increasingly widespread presence of electronic publications (see below, § 6.6), and kindly provide useful links when the recorded items are freely available online.

Checklist of Editions of Greek, Latin, Demotic, and Coptic Papyri, Ostraca, and Tablets

Founding Editors: John F. Oates and William H. Willis

This new instance of the Checklist is a work in progress. Most of the data already supersede those of the previous site. Previous print and online editions were curated by a board of Editors, founded by the late Professors John F. Oates and William H. Willis. This latest carries forward the spirit of openness and collaboration that they championed. Abbreviations are arrived at after discussion by a variety of stakeholders, including Joshua D. Sosin (Duke), Rodney Ast (Heidelberg), Roger S. Bagnall (NYU), James M.S. Cowey (Heidelberg), Mark Depauw (Leuven), Alain Delattre (Brussels), Robert Maxwell (BYU), Paul Meiporu (Stasbourg), volume editors, and others, sometimes including the wider papyrological community (via [papylist](#)). The quickest way to initiate discussion of updates and abbreviations is to write the [papylist](#), or any one of the individuals named above. Editors are strongly urged to let us know when new volumes are published.

Papyri

Actenstücke

= *Actenstücke aus der Königl. Bank zu Theben in den Museen zu Berlin*, London, Paris, ed. U. Wilcken, Berlin 1887. (AbhBerlin 1886, Anhang, Abh. 1; rp. in U. Wilcken, *Berliner Akademieschriften zur Alten Geschichte und Papyruskunde I* [Leipzig 1970] 39–104). Nos. 1–12. Republished in UFZ II 205–207, 214–215, 217–221, 226–228. [MF 1.10; rp. DZA]

BGU

= *Aegyptische Urkunden aus den Königl. (later Staatl.) Museen zu Berlin, Griechische Urkunden*, Berlin. [hgu](#)

- I, 1895. Nos. 1–361. [MF 1.1; rp. CC] [hgu.1](#)
- II, 1898. Nos. 362–696. [MF 1.2; rp. CC] [hgu.2](#)
- III, 1903. Nos. 697–1012. [MF 1.3; rp. CC] [hgu.3](#)
- IV, 1912. Nos. 1013–1209. [MF 1.4; rp. CC] [hgu.4](#)

- XXI, Akten des 21. Internationalen Papyrologenkongresses, Berlin, 13.–19. 8. 1995. 2 vols. ed. B. Kramer, W. Luppe, H. Machler and G. Poethke. (Archiv Beihett 3, Stuttgart and Leipzig 1997).
- XXII, Atti del XXII Congresso Internazionale di Papirologia, Firenze, 23–29 agosto 1998. 2 vols. Separate vol. of plates. Ed. I. Andorlini, G. Bastianini, M. Manfredi and G. Menzi. (Istituto Papirologico "G. Vitelli", Florence 2001).
- XXIII, Akten des 23. Internationalen Papyrologenkongresses, Wien, 22.–28. Juli 2001, ed. by B. Palme (Pap.Vind. 1, Vienna 2007).
- XXIV, Proceedings of the 24th International Congress of Papyrology, Helsinki, 1–7 August, 2004, 2 vols. ed. J. Grösjen, T. Puroila and E. Salmenkivi. (Societas Scientiarum Fennica, Commentationes Humanarum Litterarum 122). Helsinki 2007.
- XXV, Proceedings of the 25th International Congress of Papyrology, Ann Arbor, July 29–August 4, 2007, ed. T. Gagos and A. Hyatt. (American Studies in Papyrology, Special Edition). Ann Arbor 2010. [Online: Mich.Publ.](#)
- XXVI, Actes du 26e Congrès international de papyrologie, Genève 16–21 août 2010, ed. P. Schubert. Geneva, 2012.

CoptCongr

- I, The Future of Coptic Studies. First International Congress of Coptology, Cairo, December 1976, ed. R. McL. Wilson. (Coptic Studies 1). Leiden 1978.
- II, Acts of the Second International Congress of Coptic Studies, Roma, 22–26 September 1980, ed. T. Orlandi and F. Wisse. Rome 1983.
- III, Coptic Studies. Acts of the Third International Congress of Coptic Studies, ed. W. Godlewski. Warsaw 1990.
- IV, Actes du IVe Congrès copte. Louvain-la-Neuve 5–10 septembre 1988, vol. 1 Art et archéologie; vol. 2 De la linguistique au gnosticisme, ed. M. Rassart-Debergh and J. Ries. (Publications de l'Institut Orientaliste de Louvain 40–41). Louvain 1992.

2.4A Flock without a Shepherd (On Bibliographical Standards)

A strong claim to uniform bibliographical standards underlay the “plan” of BP as presented in 1977 by Georges Nachtergaele, beside the announcement of the digital treatment of the bibliographical records (see above, § 2.1). That plan, elaborated by Hombert, Nachtergaele and Bagnall, consisted basically in the definition of numbered subjects, in order to index and categorize the relevant

publications recorded. It took the *Bibliografia Metodica* (“methodical, systematic bibliography”) introduced by Aristide Calderini in the journal *Aegyptus* since 1920 as a model, with significant improvements that were subsequently adopted by Orsolina Montevocchi for the Italian journal as from 1978⁸⁴. In Hombert’s and Nachtergaele’s words, “cette précieuse adhésion permet d’espérer que désormais un système bibliographique unique sera universellement accepté dans le domaine de la papyrologie”⁸⁵.

The thorniest issue was faced under category 140, “Éditions” (i.e. of papyri, *ostraka*, and tablets). The editors of the *Bibliographie* subdivided the group alphabetically, according to the abbreviations of the reference editions or *corpora*. “Dans le choix des abréviations, de grands efforts ont été faits pour répondre à des conditions parfois difficiles à réunir: adopter les abréviations le plus souvent usitées, présenter un système cohérent, concilier la brièveté et la clarté”⁸⁶. Though the *Checklist of Editions* had been launched three years earlier, the bibliographers decided to follow it only partially, with the intention to establish “une liste standard, s’imposant à tous, des abréviations”, admittedly inspired by sir Eric Turner’s recommendations⁸⁷.

The same standardizing wish was expressed also by the founders of the *Checklist*:

The references established here have been adopted by the American Society of Papyrologists as official for their publications, the *Bulletin of the American Society of Papyrologists* and the monograph series, *American Studies in Papyrology*, and by the journal *Greek, Roman and Byzantine Studies*. In addition, the journal *Phoenix* follows the practices of the *Bulletin of the American Society of Papyrologists* in matters of papyrological citation. We hope that adoption of the list will spread further; we also hope that the list will alert papyrologists to the confusing and anomalous practices of the past and lead to greater consistency and clarity in the future⁸⁸.

Unfortunately, those pleas have never been fulfilled. The most striking piece of evidence for this lies in the digital version of the *Bibliographie Papyrologique* hosted on *Papyri.info*, which retains the BP abbreviating system, while the links point to the *Papyri.info* URLs based on the *Checklist* (highlighted in the picture beneath; see below, §§ 8.3–4).

Original BP record

Index: 145-4

Index bis: 145-4 O. Brooklyn Wilbour 20; 22; 30; 37; 40; 65; 72; 75; 77; 78 P. Tebt. I. 63; 64 (a); 93; 94

Title: Shelton John C., *Critical Notes on Greek Papyrus and Ostracot Texts*.

Publication: BASP 7 (1970) pp. 9-12.

Résumé: P. Tebt. I. 63, 99 and 64 (a), 49; 93, 12; 94, 24; O. Wilb. 20; 22, 5; 30, 4; 37, 1 and 2; 40; 65, 4; 72, 2; 75, 1; 77, 4; 78, 4, S.B. & S.E.G.; S.B. XII, 10778 (O. Brooklyn Wilbour 40).

No: 1970-0395

Provisional papyri.info output

48040. John C. Shelton, "Critical Notes on Greek Papyrus and Ostracot Texts.," *Bulletin of the American Society of Papyrologists*, 7 (1970). [xml](#) | [edit](#)

Mentioned Texts

[O. Brooklyn Wilbour 20](#)

[O. Brooklyn Wilbour 22](#)

[O. Brooklyn Wilbour 30](#)

[O. Brooklyn Wilbour 37](#)

[O. Brooklyn Wilbour 40](#)

[P. Tebt. I. 63](#)

[P. Tebt. I. 99](#)

[P. Tebt. I. 64 \(a\)](#)

[S.B. & S.E.G.](#)

[S.B. XII](#)

[10778](#)

[O. Brooklyn Wilbour 40](#)

O. Brooklyn Wilbour 40

papyri.info/ddbdp/o.wilb;40

View in PN

The increasing adoption of the *Checklist* as a standard reference for papyrological abbreviations pushed the editors of BP, unable to correct tens of thousands of past bibliographical cards, to issue a concordance between the two systems (http://www.aere-egke.be/sigles_pap.pdf), where the BP abbreviations are explicated with those of the *Checklist*. On the other hand, the editors of the *Berichtigungsliste* have very recently announced that the renowned collection of emendations to published papyri will make use of the *Checklist* abbreviations from planned volume XIV onwards, “with a view to the integration of BL material into the existing databases”⁸⁹. The strong integrating and standardizing afflatus of digital papyrological resources, as already sketched in the *Introduction* (§ 1.2), would be the perfect ground for realizing the desirable ideal of a common, uniform system of abbreviations, which surely every papyrologist shares. Unfortunately, this is not (yet) the case, if we note that the other two biggest papyrological platforms, the *Heidelberger Gesamtverzeichnis* and *Trismegistos* (see below, §§ 3.1 and 3.3), adopt each own idiosyncratic system, to which add those used by the current *Berichtigungsliste* and Hagedorn’s *WörterListen* (see below, § 4.1), partially or totally different – *ça va sans dire* – from BP and *Checklist*⁹⁰. At least, a complete concordance, like that once appended to the early Duke checklists⁹¹, and possibly searchable, would be most helpful.

“Without tradition, art is a flock of sheep without a shepherd. Without innovation, it is a corpse”, said Winston Churchill. A very recent and masterful contribution, delivered by Peter Arzt-Grabner at the International Congress of Barcelona (2016), resumes the traditional principles of papyrological abbreviations and points out the inconsistencies between the different systems in fashion, also providing a very useful and complete concordance table. “It is a good opportunity now”, Arzt-Grabner says, “after an extensive relaunch of the *Checklist* in 2014 and regular updates since then, to collect such inconsistencies, and to try to find practical solutions wherever necessary or reasonable”. He obviously refers to the migration of the *Checklist* to the *Papyri.info* platform, and his claim is a wonderful example of

how digital innovation might offer a starting point for reviving a traditional flock without a shepherd⁹². Though “inconsistency is too common to be criminal”⁹³, I strongly wish that his suggestions will be seriously taken into consideration for the next developments of Digital Papyrology.

2.5 Special Bibliographies

It goes without saying that papyrological bibliographical information can be extracted also from more general electronic bibliographies dealing with classics or ancient studies, like *L'Année Philologique*⁹⁴, but of course this is far beyond the purposes of the present book. Some attempts to provide introductory bibliographical surveys of the matter come in plain HTML web pages, like the papyrological section of the *Bibliotheca Classica Selecta* (BCS) implemented by the Université Catholique de Louvain (<http://bcs.fltr.ucl.ac.be/Papy.html>). After a general overview of the discipline, this website provides some descriptive pages listing reference works and handbooks, examples of text editions, work tools (anthologies, dictionaries, grammars, onomastic repertories, palaeography, periodicals...), books dealing with historical studies based on papyrological evidence, and a selection of electronic tools. Equally basic and introductory bibliographies to papyrological studies are provided e.g. by the *Duke Papyrus Archive*, with the addition of a section devoted to literature on papyri, or by the Papyrus Collection of the University of Michigan, in DOC format⁹⁵. All of these are intended to provide a first acquaintance to the discipline, and by no means aim at completeness.

A useful “evolving” bibliography on *Ancient Libraries* is offered by W.A. Johnson (http://people.duke.edu/~wj25/uc_web_site/libraries/library_biblio.html), while web pages like *Ptolemaica. Une bibliographie sur l’Égypte lagide* (by Chr. Hugot, Bibliothèque des Sciences de l’Antiquité – Université Lille 3, <http://bsa.biblio.univ-lille3.fr/ptolemaica>) and *A Hellenistic Bibliography* (by M. Cuypers, Trinity College Dublin, <https://sites.google.com/site/hellenisticbibliography>) provide a good historical, cultural, and literary background to papyrological studies for the Hellenistic period, but are not papyrological resources *stricto sensu*.

Other special bibliographies are intended to support specific projects. This is the case with the *Ancient Alexandria* project conducted by P. Van Minnen at the University of Cincinnati, hosting an introductory papyrological bibliography along with special repertories about Alexandria, in particular its Roman phase⁹⁶. It is worth mentioning also *The Books of Herculaneum*, “a guide to editions and translations of the principal works discovered at Herculaneum and related texts” maintained by The Friends of Herculaneum Society (<http://www.herculaneum.ox.ac.uk/?q=books>, see below, § 7.1).

When a thematic bibliography tends to be particularly complex, static

online pages are not enough any longer: therefore, for example, the bibliography about the Herculaneum papyri embedded in the online catalogue *Chartes* is wisely provided with a search engine, though a plain general bibliographical list is added anyway⁹⁷. Also the bibliography on mummy labels (alphabetic both by author and by country) on the *Death on the Nile* project website (see below, § 3.5) is provided with an internal search tool. For other thematic bibliographies connected to specific projects, as well as for the bibliographical information included in the metadata catalogues, see the next chapter 3.

A strong digital bibliographical tradition is embodied by Belgian papyrologists. Apart from the complete bibliography of Claire Préaux, provided by the Université Libre de Bruxelles as a digital version of a print book by M.-Th. Lenger, on occasion of the 100th anniversary of the famous papyrologist's birth⁹⁸, it is in particular the Centre de Documentation de Papyrologie Littéraire (CEDOPAL) at the University of Liège that holds the biggest number of special bibliographies dealing with papyrological matters⁹⁹. These bibliographies present two interesting features. Firstly, most of them are connected to the development of the *Mertens-Pack3* catalogue¹⁰⁰, probably the main achievement of the CEDOPAL, of which we will discuss further on (§ 3.2): they are basically the product of data extraction from the catalogue cards of the literary papyri recorded in the M-P³ base. Secondly, they do not belong to the trend of transition from paper to digital supports: unlike the *Bibliographie Papyrologique* and the *Checklist* (and Préaux's bibliography), they were born as digital resources, later included in printed publications. A third interesting aspect is that they were first published as HTML web pages, while now they appear as PDF files embedded in the web pages themselves, which gives them a sort of borderline format between paper and digital supports.

Directly depending on the M-P³ catalogue are the extensive bibliographies on literary papyri by ancient authors and by sub-genres¹⁰¹: both of them exhibit a drop-down menu, from which one can choose the author or the genre on which he wants to consult the bibliography, each one in a single PDF file. The bibliography for sub-genre "Medicine and surgery" has been published at the beginning of two preliminary accounts of the M-P³ catalogue records dealing with medical papyri provided by Marie-Hélène Marganne and Paul Mertens¹⁰².

Other extensive bibliographies stem from the traditional fields of interest and research of CEDOPAL. The cultural and bibliological studies are represented by *Alexandria Docta*, a general bibliography on the intellectual and scientific life centred on ancient Alexandria (by Nathaël Istasse, 2003 ff., updated for 2008–2016 by Marganne), and *Liber Antiquus*, a general bibliography on books in the Graeco-Roman world (by Jean-Christophe Dideren, 2004 ff., updated for 2005–2016 by Marganne)¹⁰³. Both have been published in 2004 as appendixes of the first two "Cahiers du CeDoPaL"¹⁰⁴.

Further bibliographies dealing with medical papyri and ancient medical culture are to be found in the section *Médecine dans l'Égypte gréco-romaine*¹⁰⁵ and are devoted to pharmacology (*Pharmacopoea Aegyptia et Graeco-Aegyptia*, by Marganne and Pierre Koemoth), literary medical papyri (*Medici et medica*, which expands a bit the aforementioned medical bibliography), iatromagical papyri (with a short introduction by Magali De Haro Sanchez), medical petitions and reports (by Antonio Ricciardetto), private letters with medical content (by Ricciardetto as well)¹⁰⁶. All of them, except the first two, flank a catalogue of the relevant texts, extracted from the main M-P³ base (see below, § 3.2). Another section is devoted to Robert Cavañale's *Corpus Papyrorum Latinarum* and the project of its update¹⁰⁷, and collects special bibliographies about Latin papyri (*Papyri Latinae*, mainly focused on literary texts and their writings), Latin papyri of Herculaneum (by Gabriel Nocchi Macedo), Jew and Christian Latin papyri (by Nocchi Macedo), bilingualism Greek / Latin and trilingualism Greek / Latin / Coptic in Egypt (by Nathan Carlig and Bruno Rochette)¹⁰⁸. Finally, *Judaica et Christiana*¹⁰⁹ offers bibliographies about Jew and Christian authors of the I and II centuries AD (with introduction, by Carlig), Didymus Caecus (with introduction, again by Carlig), Greek Christian letters of literary character (by Carlig as well), Greek and Latin Christian school texts on papyrus (with introduction, by the same Carlig)¹¹⁰. Most of them stem from recent additions made to the M-P³ catalogue (see below, § 3.2).

If we are allowed to extract some general conclusion from the CEDOPAL online bibliographies, then we can certainly stress that they are a clear example of how digital resources are not to be regarded as a mere replacement, or a conflicting double, of more traditional paper resources, but can produce a wise scholarly interplay where the electronic outcome is not the ultimate achievement, nor an optional tool, but a robust ground for further scholarship that may even come back to more traditional ways of expression (see also below, § 3.2).



A peculiar bibliographical tool developed on the *Aristarchus* portal for classical studies of the University of Genua¹¹¹ was an index to the papyri

mentioned in the *Année Philologique* (the famous bibliographical resource for ancient studies), edited by Franco Montanari and Laura Moisélio in the framework of the Centro Italiano dell'Année Philologique (CIAPh)¹¹². This database contained the reference to all the papyri, *ostraka* and tablets mentioned in the APH as of volume LXXI (2000). When possible, the edition *sigla* were uniformed according to the *Checklist* standards. The archive was searchable either/both by papyrus edition or/and by APH reference, but it seems lacking from the renovated version of the portal (<http://www.aristarchus.unige.net/CIAPh/it-IT/Home>).



Università degli
Studi di Genova

CIAPh

Centro Italiano dell'Année Philologique

diretto da Franco Montanari

Menu principale

- Home Page [A]
- Libri ricevuti [B]
- Schedatura del CIAPh
 - Bibliote [C]
 - Miscelanea [D]
- Strumenti per APH
 - Indice manoscritti [E]
 - Indice papiri [F]
 - Segnalo Riviste APH [H]
- Bibliografia [I]
- Links [J]
- Servizi [S]
- Aristarchus [I]
- Login [L]

- Sito accessibile [M]
- English index [7]

Area riservata

Indice dei papiri citati in APH

(a cura di Franco Montanari e Laura Moisélio)

L'archivio contiene i dati di papiri, tavolette e ostraca citati nell'*Année Philologique*, a partire dal volume 71 (2000). Per le schede di questo archivio si è proceduto a una normalizzazione e omologazione delle citazioni: per papiri, tavolette e ostraca edili, la sigla sarà quella indicata nella *Checklist of Editions of Greek Latin Roman and Coptic Papyri, Ostraca and Tablets*, web edition by John F. Oates, Roger S. Dagnall, Sarah J. Clarkson, Alexandra A. O'Brien, Joshua D. Sosin, Tony G. Willong, and Klaus A. Worp (<http://escholarium.ub.edu/ochalypapyrus/texts/cist.html>); negli altri casi si sono conservate le sigle indicate in APH o quelle comunemente in uso. I dati sono quelli forniti nelle schede di APH, a cui si fa riferimento.

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Tabelle	Formular	Suche	?	Home
Datenbank: <u>hauptregister</u>				
Datensatz 1 von 50195				
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other :	URL	✓	contains	

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Introduction

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Style, Metrics

Data Standards

Database structure

History

Help out

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Library, National Museum of Antiquities

ABOUT SITE

Trigrammagica Home

PLACES INFO

Places mentioned in Collected Texts

Places known in Texts

Rijksmuseum van Oudheden in Leiden (OMRO) 56 (1975), p. 29-64 / Pap. Gracc. 146 (1975), p. 29-64 / Pap. Gracc. 146 (1975), p. 29-64 / Pap. Gracc. 146 (1975), p. 29-64

Texts | **TM Home** | About | Contact

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Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden te Leiden (OMRO) 56 (1975), p. 29-64 (Johnson, Janet IL) + Pap. Gracc. Mag.(2) 2 12 (XII) (Preisendanz, Karl)

= P. Leiden Gr. 2 no. V (p. 57-76) (Leemans, Conrad)

= Heitsch, Die Griechischen Dichterfragmente 1 p. 179 no. LIX 1 (Heitsch, Ernst)

= Daniel, Two Greek magical papyri (Pap. Colon. 19) p. 2-29 (Daniel, Robert Walter)

= Betz, The Greek magical papyri in translation p. 153-172 no. PGM 12 (Martin, Hubert Jr. / Hock, Ronald F. / Grese, W. C. / Kotansky, Roy D. / Scarborough, John / Smith, Morton / Hershbell, J. P. / Betz, Hans Dieter / Johnson, Janet H.)

= Pap. Gracc. Mag.(2) 2 Hymnen 1 p. 237 (Preisendanz, Karl)

= 1 Halleux, Les alchimistes grecs I p. 163-166 fr. 4 (Halleux, Robert)

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Pollution: Col. 146, 146a, 146b, 146c, 146d, 146e, 146f, 146g, 146h, 146i, 146j, 146k, 146l, 146m, 146n, 146o, 146p, 146q, 146r, 146s, 146t, 146u, 146v, 146w, 146x, 146y, 146z, 146aa, 146ab, 146ac, 146ad, 146ae, 146af, 146ag, 146ah, 146ai, 146aj, 146ak, 146al, 146am, 146an, 146ao, 146ap, 146aq, 146ar, 146as, 146at, 146au, 146av, 146aw, 146ax, 146ay, 146az, 146ba, 146bb, 146bc, 146bd, 146be, 146bf, 146bg, 146bh, 146bi, 146bj, 146bk, 146bl, 146bm, 146bn, 146bo, 146bp, 146bq, 146br, 146bs, 146bt, 146bu, 146bv, 146bw, 146bx, 146by, 146bz, 146ca, 146cb, 146cc, 146cd, 146ce, 146cf, 146cg, 146ch, 146ci, 146cj, 146ck, 146cl, 146cm, 146cn, 146co, 146cp, 146cq, 146cr, 146cs, 146ct, 146cu, 146cv, 146cw, 146cx, 146cy, 146cz, 146da, 146db, 146dc, 146dd, 146de, 146df, 146dg, 146dh, 146di, 146dj, 146dk, 146dl, 146dm, 146dn, 146do, 146dp, 146dq, 146dr, 146ds, 146dt, 146du, 146dv, 146dw, 146dx, 146dy, 146dz, 146ea, 146eb, 146ec, 146ed, 146ee, 146ef, 146eg, 146eh, 146ei, 146ej, 146ek, 146el, 146em, 146en, 146eo, 146ep, 146eq, 146er, 146es, 146et, 146eu, 146ev, 146ew, 146ex, 146ey, 146ez, 146fa, 146fb, 146fc, 146fd, 146fe, 146ff, 146fg, 146fh, 146fi, 146fj, 146fk, 146fl, 146fm, 146fn, 146fo, 146fp, 146fq, 146fr, 146fs, 146ft, 146fu, 146fv, 146fw, 146fx, 146fy, 146fz, 146ga, 146gb, 146gc, 146gd, 146ge, 146gf, 146gg, 146gh, 146gi, 146gj, 146gk, 146gl, 146gm, 146gn, 146go, 146gp, 146gq, 146gr, 146gs, 146gt, 146gu, 146gv, 146gw, 146gx, 146gy, 146gz, 146ha, 146hb, 146hc, 146hd, 146he, 146hf, 146hg, 146hh, 146hi, 146hj, 146hk, 146hl, 146hm, 146hn, 146ho, 146hp, 146hq, 146hr, 146hs, 146ht, 146hu, 146hv, 146hw, 146hx, 146hy, 146hz, 146ia, 146ib, 146ic, 146id, 146ie, 146if, 146ig, 146ih, 146ii, 146ij, 146ik, 146il, 146im, 146in, 146io, 146ip, 146iq, 146ir, 146is, 146it, 146iu, 146iv, 146iw, 146ix, 146iy, 146iz, 146ja, 146jb, 146jc, 146jd, 146je, 146jf, 146jg, 146jh, 146ji, 146jj, 146jk, 146jl, 146jm, 146jn, 146jo, 146jp, 146jq, 146jr, 146js, 146jt, 146ju, 146jv, 146jw, 146jx, 146jy, 146jz, 146ka, 146kb, 146kc, 146kd, 146ke, 146kf, 146kg, 146kh, 146ki, 146kj, 146kk, 146kl, 146km, 146kn, 146ko, 146kp, 146kq, 146kr, 146ks, 146kt, 146ku, 146kv, 146kw, 146kx, 146ky, 146kz, 146la, 146lb, 146lc, 146ld, 146le, 146lf, 146lg, 146lh, 146li, 146lj, 146lk, 146ll, 146lm, 146ln, 146lo, 146lp, 146lq, 146lr, 146ls, 146lt, 146lu, 146lv, 146lw, 146lx, 146ly, 146lz, 146ma, 146mb, 146mc, 146md, 146me, 146mf, 146mg, 146mh, 146mi, 146mj, 146mk, 146ml, 146mm, 146mn, 146mo, 146mp, 146mq, 146mr, 146ms, 146mt, 146mu, 146mv, 146mw, 146mx, 146my, 146mz, 146na, 146nb, 146nc, 146nd, 146ne, 146nf, 146ng, 146nh, 146ni, 146nj, 146nk, 146nl, 146nm, 146nn, 146no, 146np, 146nq, 146nr, 146ns, 146nt, 146nu, 146nv, 146nw, 146nx, 146ny, 146nz, 146oa, 146ob, 146oc, 146od, 146oe, 146of, 146og, 146oh, 146oi, 146oj, 146ok, 146ol, 146om, 146on, 146oo, 146op, 146oq, 146or, 146os, 146ot, 146ou, 146ov, 146ow, 146ox, 146oy, 146oz, 146pa, 146pb, 146pc, 146pd, 146pe, 146pf, 146pg, 146ph, 146pi, 146pj, 146pk, 146pl, 146pm, 146pn, 146po, 146pp, 146pq, 146pr, 146ps, 146pt, 146pu, 146pv, 146pw, 146px, 146py, 146pz, 146qa, 146qb, 146qc, 146qd, 146qe, 146qf, 146qg, 146qh, 146qi, 146qj, 146qk, 146ql, 146qm, 146qn, 146qo, 146qp, 146qq, 146qr, 146qs, 146qt, 146qu, 146qv, 146qw, 146qx, 146qy, 146qz, 146ra, 146rb, 146rc, 146rd, 146re, 146rf, 146rg, 146rh, 146ri, 146rj, 146rk, 146rl, 146rm, 146rn, 146ro, 146rp, 146rq, 146rr, 146rs, 146rt, 146ru, 146rv, 146rw, 146rx, 146ry, 146rz, 146sa, 146sb, 146sc, 146sd, 146se, 146sf, 146sg, 146sh, 146si, 146sj, 146sk, 146sl, 146sm, 146sn, 1

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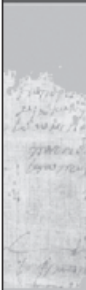
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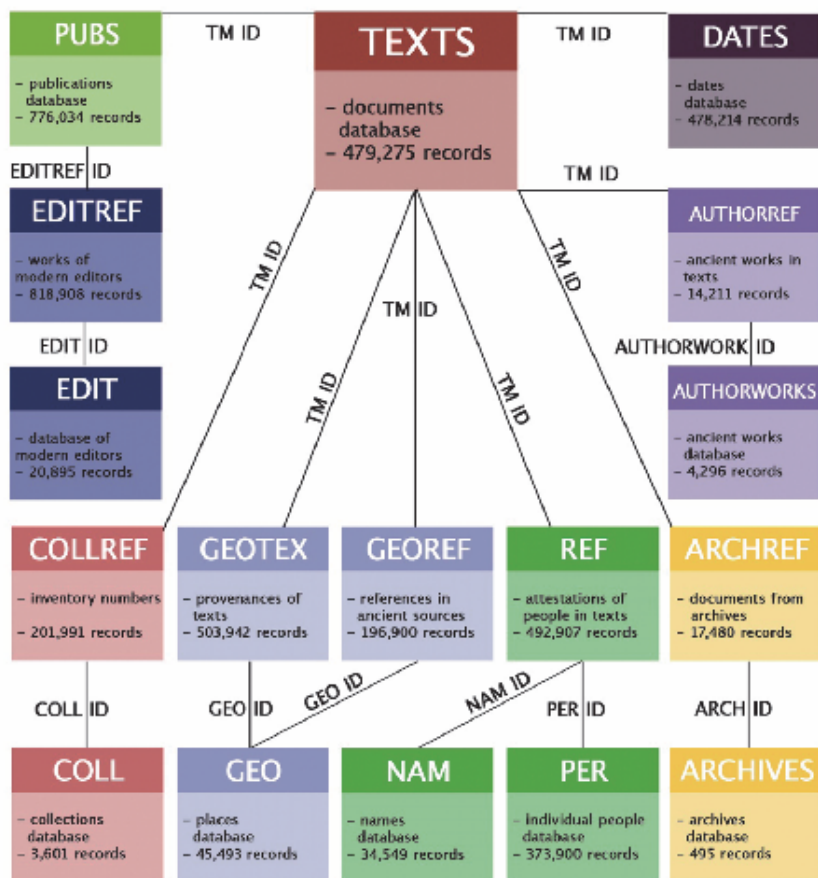
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Menu principale

- Home Page (A)
- Pagine (B)
- Biblioteca (C)
- Studi (S)
- Archivi (T)
- Ricerche (C)
- Sito accessibile (I)
- English (Z)



PAPIRI IN ARCHIVIO

Filtra per collezione:

Filtra per contenuto:

- II 001 P.Berol. inv. 5014 - Scholia Minora ad II 1, 1-46, 8-12
- II 002 P.Nich. inv. 1598 - Scholia Minora ad II 1, 1-9
- II 003 P.Achim. 2 (Paris, BnF, Suppl. gr. 1008, 3) - Hypothesis Scholia Minora ad II 1, 1-121
- II 004 P.Oxy. 44.1207 - Scholia Minora ad II 1, 4-18
- II 005 P.Dub. 2.12 (inv. 308) - Periphrase à Omero à Scholia Minora ad II 1, 1-24
- II 006 P.JACO inv. 105 - Scholia Minora ad II 1, 10-12
- II 007 P.Oxy. inv. 44 59.61AC(4-6)a - Scholia Minora ad II 1, 23-40(?)
- II 007.1 P.Cair. Journal d'Entrée 45012 - Scholia Minora (periphrase) ad II 1, 43-45, 46-50
- II 008 P.Oxy. inv. 48 59.61BE(4-5)a - Scholia Minora ad II 1, 53-75(?)
- II 009 P.Oxy. 24.7405 - Scholia Minora ad II 1, 58-105
- II 009.1 P.Yale 2.125 (inv. 1248) - Scholia Minora ad II 1, 68-74
- II 010 P.Nam. inv. 68.43 - Scholia Minora ad II 1, 73-74, 90-91
- II 011 P.Texas 15 (P.Mich. inv. gr. 35+40+41) + P.Mich. inv. gr. 33 - Scholia Minora ad II 1, 81-351
- II 011.1 P.Berol. inv. 21308 - Scholia Minora ad II 1, 97-99
- II 012 P.Nich. inv. 1585 - Scholia Minora ad II 2, 173-183
- II 012.1 P.Yale 2.126 (inv. 1544) - Scholia Minora ad II 1, 180-228
- II 013 P.Palaeogr. Lib. 1.8 (inv. 147) - Scholia Minora ad II 1, 191-185, 225-238, 237-281, 293-116 (non sequens)
- II 014 P.Schubart 2 (P.Berol. inv. 7601) - Scholia Minora ad II 1, 268-272
- II 015 P.Oxy. 45.3237 - Scholia Minora ad II 1, 279-345
- II 016 P.Dub. (P.Klein) inv. 2281 - Scholia Minora ad II 1, 319-410, 512-612
- II 016.1 P.Oxy. 75.4818 - Scholia Minora ad II 1, 326-336, 340-363

The previous interface of *Scholia Minora in Homerum*.

3Cataloguing Metadata

It seems clear that the future of the Internet does not lie in increased uniformity and central management. Instead, it lies in devising clever tools for collecting and presenting data from multiple sources. Papyrology will undoubtedly do best to go with that technological and sociological trend.

Traianos Gagos¹¹³

great improvements in the cataloguing of a large amount of information, in terms of speed, completeness, ease of managing, in both the processing and the publishing phases. In the following pages, I will analyse and discuss the existing papyrological digital catalogues, both general and specialized, whether static or equipped with a search engine.

3.1 The *Heidelberger Gesamtverzeichnis*

As James Cowey himself explained, presenting the project at the 20th International Congress of Papyrology, in Copenhagen (1992)¹¹⁵, the idea of creating a comprehensive catalogue of all published papyri (a work, the research outcome of which is apparent) was at first of purely palaeographical sort. It was Richard Seider, with his strong interest in palaeography, who thought of a complete “list of all published papyri, which contained a definite date and of which there was also a published image. This was then to have been processed as a series of photographic volumes, the intention being to provide a tool to help in the dating of papyri”¹¹⁶. Then, when Dieter Hagedorn resumed that project, in 1988, with appropriate funding, thought it better to broaden the original idea to encompass all published papyri *tout court*, whether with or without published pictures, and to concentrate on documentary texts – hence the name: *Heidelberger Gesamtverzeichnis der griechischen Papyrusurkunden Ägyptens*, abbreviated in HGV. For this task, “a computer data-base seemed an obvious choice, in as much as this is able to make available a lot of information in its most accessible form”. It was chosen to store the information in a *FileMaker* database¹¹⁷, which allowed to easily create fields for each type of information, to fill in them, and to publish the resulting databank in both an offline format (a *FileMaker* dataset originally released in the *Subsidia Papyrologica* CD-ROMs¹¹⁸) and an online version (now <http://aquila.zaw.uni-heidelberg.de>, formerly <http://www.rzuser.uni-heidelberg.de/~gv0>). Thanks to the *FileMaker* format, it is also possible to use the HGV metadata as a base for the creation of further databanks, selecting the relevant fields and adding new ones, according to the needs.

Thus, HGV itself follows the overall trend of the constitution of the digital tools, from paper resources to electronic ones, with the only difference that the starting paper resource was a would-be one, and it took full reality only thanks to informatics. This is remarkable too¹¹⁹. Two aspects of the original project were retained, and are still pivotal in HGV: the attention to the dating of each papyrus, very precise, carefully checked and, if necessary, corrected (HGV remains the ultimate resource for reliable dating of published papyri¹²⁰), and to the existence of published pictures, a complete record of which is provided when available.

The current welcome page displays a list of all the records in a table (“Tabelle”, see picture below). This table is arranged in four columns (“Publikation”, “Datierung”, “Ort”, “Originaltitel”) and it is possible to reorder it in several ways, by clicking on the title of each column (first click: ascending order; second click: descending order). “Publikation” refers to what the *Berichtungsliste* (see below, § 4.5) considers as the main publication of the text; other possible editions are accounted in the “Andere Publikationen” field, available from the record complete view (“Formular”). “Ort” is the place where the papyrus was written, when it is possible to state¹²¹. “Originaltitel” refers to the original title of the main publication, in whichever language it was published. The other pieces of information (metadata) to be found in the HGV records are: material of the fragment (“Material”); full list of published pictures (“Abbildung”); possible corrections, after the BL Concordance (“BL-Einträge”); miscellaneous annotations or bibliographical references (“Bemerkungen”); internal reference to different dates (“Erwähnte Daten”); reference to existing translations in modern languages (“Übersetzungen”); one or more keywords that describe the content of the text (“Inhalt”)¹²². These keywords (in German) are not based on a standard word list, so that the categorization of the texts is not always uniform¹²³. The fields are all searchable through a query mask (“Suche” from the top menu), with a special attention to dates (it is possible to combine various criteria: year, month, day, century, and chronological ranges¹²⁴); a further section of the website (“Texte”) allows browsing through hyperlinked lists of papyrus editions.



Datensätze 1-100 von 61425 Suchtreffern (Gesamt: 61425)

?

	<u>Publikation</u>	<u>Datierung</u>	<u>Ort</u>	<u>Originaltitel</u>	<u>Erwähnte Daten</u>
1	SB XIV 11942	331 v.Chr. (?)	Sekkara (Memphites)	Zutrittsverbot	
2	P.Eleph. 1	310 v.Chr., 17. Juli - 15. Aug.	Elephantine	Ehevertrag	
3	SB XVIII 13190	IV - I v.Chr.	Theben	Getreidesteuerquittung	
4	SB XVIII 13191	IV - I v.Chr.	Theben	Getreidesteuerquittung	
5	SB XVIII 13212	IV - I v.Chr.	Theben	Briefliche Anweisung	
6	SB XVIII 13214	IV - I v.Chr.	Theben	Speicherabrechnung	
7	SB XVIII 13215	IV - I v.Chr.	Arsinoites	Abrechnung	
8	SB XVIII 13669	IV v.Chr. - IV n.Chr.	Diospolis Magna (Theben)	Proskynema	
9	SB XVIII 13670	IV v.Chr. - IV n.Chr.	Diospolis Magna (Theben)	Proskynema	
10	SB XVIII 13671	IV v.Chr. - IV n.Chr.	Diospolis Magna (Theben)	Name (?)	
11	SB XVIII 13672	IV v.Chr. - IV n.Chr.	Diospolis Magna (Theben)	Proskynema	
12	SB XVIII 13673	IV - I v.Chr.	Diospolis Magna (Theben)	Name	
13	SB XVIII 13679	IV - I v.Chr. (?)	Diospolis Magna (Theben)	Name	
14	SB XVIII 13681	IV v.Chr. - IV n.Chr.	Diospolis Magna (Theben)	Name	
15	SB XVIII 13684	IV v.Chr. - IV n.Chr.	Diospolis Magna (Theben)	Proskynema	
16	SB XVIII 13686	IV - I v.Chr.	Diospolis Magna (Theben)	Proskynema	
17	SB XVIII 13687	IV - I v.Chr.	Diospolis Magna (Theben)	Proskynema	
18	SB XVIII 13688	IV v.Chr. - IV n.Chr.	Diospolis Magna (Theben)	Proskynema	
19	SB XVIII 13689	IV - I v.Chr.	Diospolis Magna (Theben)	Proskynema	
20	SB XVIII 13690	IV v.Chr. - IV n.Chr.	Diospolis Magna (Theben)	Proskynema	

Suchkriterien?

→ Suchhilfe → Search Help

☒ Entsprechung mit allen Wörtern auf der Seite (UND) ☐ Entsprechung mit beliebigem Wort auf der Seite (ODER)

Publikation	Enthält	↕
Band	Ist gleich	↕
Nummer	Ist gleich	↕
Andere Publikation	Spaltensuche	↕
Ort	Spaltensuche	↕
Originaltitel	Spaltensuche	↕
Material	Enthält	↕
Inhalt	Spaltensuche	↕
Bemerkungen	Spaltensuche	↕
Übersetzungen	Enthält	↕
Abbildung	Spaltensuche	↕
Link	Enthält	↕
IM Nr.	Ist gleich	↕

Jahr	Ist gleich	↕
Monat	Ist gleich	↕
Tag	Ist gleich	↕
Jahr (?)	Ist gleich	↕
Jahrhundert	Ist gleich	↕
Jahrhundert (?)	Ist gleich	↕
Chron-Minimum	Ist gleich	↕
Chron-Maximum	Ist gleich	↕
Chron-Global	Ist gleich	↕

- ☒ Nur in **Hauptdatenbank** suchen.
- ☐ Bei Suche **erwähnten Daten** mit einbeziehen.
- ☐ Nur in **erwähnten Daten** suchen.

Sortieren?

1. Suchfeld	↕	Suchrichtung	aufsteigend	↕
2. Suchfeld	↕	Suchrichtung	aufsteigend	↕
3. Suchfeld	↕	Suchrichtung	aufsteigend	↕
4. Suchfeld	↕	Suchrichtung	aufsteigend	↕
5. Suchfeld	↕	Suchrichtung	aufsteigend	↕

Blättern

Anzahl Suchtreffer pro Seite: 100 ↕

Suche starten Felder löschen

As from 2015, a new interface has been implemented, and now it completely replaces the older version of HGV. The system, based on a newer *FileMaker* technology, is now faster and more stable than before. Improvement is not only technological. In the e-mail announcing the changes to the papyrological discussion list (*Papy-list*, see below § 6.4), James Cowey noted: “We have

presented the information from the database fields in manner which is close to aspects of a printed edition”. This notably refers e.g. to the indication of publication, date and provenance of the papyrus, which are not displayed as fields as in the previous versions, but in a title-like fashion (see pictures below). The explicit statement is very meaningful as to a still unavoidable uneasiness of relationship between printed and digital scholarship (see further on, §§ 8.4 and 9). Moreover, in the name of integration and interconnection among papyrological databases, now one finds not only the link to the appropriate *Trismegistos* record (via the TM number: see below, § 3.3), which had already been implemented in the past years, but also the full text of the document, if available, directly updated from *Papyri.info* (see below, § 8.4). The previous HGV formats used to exhibit a simple link to the textual databank (DDbDP, then *Papyri.info*); the insertion of the full text is a remarkable innovation, if we think that the HGV had always avoided to deal directly with texts¹²⁵. It is true that no search functions are implemented for the text itself (one is referred to *Papyri.info* as always), but the new concern is quite clear. Further noteworthy innovations are the embedded images (a tile on the bottom right, displaying external cataloguing resources if available) and the translations¹²⁶.

Despite these latest big efforts towards integration and compatibility, standardization is still a sore spot: as HGV itself makes clear, “die Abkürzungen [*sc.* of papyrus editions] entsprechen im Wesentlichen der ‘Checklist of Editions of Greek and Latin Papyri, Ostraka and Tablets’ [...]. Gelegentliche Abweichungen sind aus sich selbst heraus verständlich”¹²⁷. Most of these “deviations” are paralleled by the *Berichtigungsliste*, at which HGV originally looked¹²⁸ (see e.g. P.Sta.Xyla for P.Athen.Xyla, or P.Ben.Mus. for P.Benaki – an effective complete overview can be found in Arzt-Grabner’s table mentioned above, § 2.4); others are uniquely idiosyncratic and due to traditional customs (e.g. VBP, i.e. *Veröffentlichungen aus den badischen Papyrus-Sammlungen*, for P.Bad. *Checklist* = P.Baden BL¹²⁹). Fortunately, integration is going to overcome most of these issues and it is now possible to jump from a resource to another one (see below, §§ 3.3 and 8.4) almost without sinking in the quicksand of papyrological conventions, though inconsistencies are always in ambush.

Heidelberger Gesamtverzeichnis der griechischen Papyrusurkunden Ägyptens

Datensatz 1 von 1

Publikation: P.Fam. Tcbr. 15**Andere Publikation:** Z. 110 + 130: SB IV 7378, Sel. Pap. II 422**Datierung:** 114 - 115**Ort:** Arsinoites**Originaltitel:** Copy of Report with Annexed Documents**Material:** Papyrus**Abbildung:** keine**RI-Einträge nach RI-Konkordanz:** VIII, S. 198**Text der DDBDP:** papyri.info**Bemerkungen:** Vgl. Kruse, Der Königliche Schreiber, S. 784-786 und 805f.**Übersetzungen:** Englisch: Johnson, Roman Egypt (1936), S. 638, Nr. 389**Inhalt:** Schreiben (amtlich), Aktien, Verwaltung, Grundbuchamt, Erbschaft, Archiv, Aufbewahrung, Urkunden, Theater**Erwähnte Daten:** Z. 4 - 41: Abschrift eines Dokuments vom 17. Okt. 108; Z. 42 - 75: Abschrift eines Dokuments von vor 17. Okt. 108; 75 - 97: Abschrift eines Dokuments vom 15. Mai 98; Z. 98 - 105: Abschrift eines Dokuments vom 9. Juli 83; Z. 105 - 109: Abschrift eines Dokuments vom 21. Juni 98; Z. 110 - 130: Abschrift eines Dokuments vom 19. Mai 103; Z. 131 - 146: Abschrift eines Dokuments vom 16. Juni 109; Z. 147 - 156: Abschrift eines Dokuments vom 16. Juni 109; Z. 46: 71 - 72**TM_Nr.:** 10732[Anfang](#)

Datensatz:

1-1

Datensätze gesamt:

[Sortieren...](#)[Alle aufrufen](#)

Unsortiert

[Abkürzungen
zitiertter Bücher](#)

Pack³ and the Leuven Database of Ancient Books

While HGV is devoted to documentary papyri, the scholars who deal with literary genres can rely on a couple of similar resources, which move from the very same concept (i.e. to provide the basic context information for each document) but focus on the ‘other side’ of the discipline (see below, § 3.4). Both move from the example of paper tools – above all R.A. Pack’s catalogue of literary papyri¹³⁰ – developing them in two slightly different and complementary directions. While it has always been impossible to produce a printed comprehensive catalogue of the documentary papyri, literary catalogues did appear, though it is apparent that such tools – just as bibliographies and related reference resources – need a continuous and constant update, which is uneasily handled with paper means: it is by now simply insufficient to consult a book from the Sixties when several hundreds of new pieces have appeared in the meantime¹³¹. At this point, such a continuous and constant update in terms of both adding new information and correcting old entries when necessary, as well as a direct and full access to information, can be granted by electronic tools only.

In fact, when Belgian papyrologist Paul Mertens, who collaborated to the second edition of Pack’s catalogue¹³², started planning a documentation centre about ancient books and literary works (the future CEDOPAL), as early as 1961¹³³, he could immediately rely on the technological support offered by the Laboratoire d’Analyse Statistique des Langues Anciennes (LASLA), founded the very same year at the University of Liège by Louis Delatte as the first research centre that applied automatic information treatment to the study of ancient languages¹³⁴. Thus he produced a volume of concordances to Pack² and a series of statistical appraisals, announcing (at the 14th International Congress of Papyrology, Oxford 1974) a third edition of the Pack catalogue¹³⁵. The electronic constitution of the new catalogue, soon named *Mertens-Pack*³, also known with the acronym M-P³, was based on records arranged as follows¹³⁶:

FICHE MP ³	
a	n° MP ³
b	AUTEUR (+ attribution/citation)
c	œuvre
d	référence
e	édition de base
f	lieu de conservation
g	institution
h	n° d'inventaire
i	date
j	provenance
k	forme
l	matériau
m	nombre de fragments, dimensions du plus grand ↔ × ↓
n	description (nombre de colonnes, marges)
o	main
p	reproduction
q	bibliographie

Several outcomes of M-P³ have been published as printed volumes¹³⁷, but the huge amount of information to manage required a more systematic and quicker resource. Thus the CEDOPAL (Centre de Documentation de Papyrologie Littéraire), in collaboration with the Centre Informatique de Philosophie et Lettres (CIPR, in particular with Denis Renard), developed an experimental platform (“Base de donnée expérimentale”¹³⁸) to manage the cataloguing records assembled by Mertens for M-P³. The electronic catalogue, available online since December 2005¹³⁹ (<http://cipr93.philo.ulg.ac.be/Cedopal/MP3/dbsearch.aspx>), is based on Mertens’ development of Pack’s cataloguing system, and is constantly updated and extended to contiguous topics formerly excluded by Pack: namely magical texts, Herculaneum papyri, Jew and Christian papyri¹⁴⁰, documentary texts¹⁴¹.

Great attention is devoted to the texts themselves: ancient writers are recorded and can be searched for either as the authors of the texts, or as citations or attributions, through drop-down menus listing the names. It is possible to search for text strings in the titles of the ancient works or in the descriptions of the contents, and the query can be further narrowed according to language, date, literary genre, sub-genre. The material support is considered too: bibliological features (autograph, colophon, label, palimpsest, etc.), material, provenance, location, collection, inventory numbers are all search criteria accessible via drop-down menus. A box can be selected if one wants to narrow his/her interest to texts coming from cartonnage. It is also possible to call up a document directly via its M-P³, TM or LDAB numerical identifiers, and to extend the query to the *delenda*, i.e. former M-P³ numbers that have been suppressed or replaced for some reason.



Version 1.0.0.0

Base de données expérimentale Mertens-Peck 3 en ligne

1. Rechercher une seule Notice Pack par son numéro unique

☒ MP3☐ Thesaurus☐ LDAB

Rechercher par numéro

2. Rechercher une ou plusieurs Notices Pack

Effacer les critères de recherche

Langue

☐ Grec

Date

☐ Entre

-491

☐ Auteur (Auteur du Note) 230 auteurs	
☒ Chantons	
☐ Antiquités	
☐ Recherche globale sur un auteur (Textes, Chantons, Antiquités)	

Titre de l'œuvre contenu

☒ Titre

Genre

☐ Non précisé

Sous-genre

☐ (Identifié par l'auteur)

Description du contenu contenu

☐ Description

Commentaire bibliographique contenu

☒ Bibliographique

Objet papyrologique

☐ Manuscrit☐ Cartonnage☐ Provenance☐ Localisation☐ Collection

Bibliographie : au sein d'une

☐ collection☒ Inventaire

(don P. Robert)

☐ Numéros d'inventaire

Étendre la recherche aux dérivés (par défaut, les dérivés ne sont pas inclus)

Rechercher

Sélectionner tout Désélectionner tout

Afficher les détails des notices sélectionnées

The resulting records are listed beneath the search mask, and it is necessary to select one or more to display. They are displayed in rectangular cards, arranged by MP³ number. A typical record (see picture below) shows author and title of the work, or the content of the papyrus, followed by references to the editions; provenance and date; palaeographical or bibliographical remarks; a very detailed bibliography (a list of the abbreviations used is provided as a separate PDF file at <http://web.philo.ulg.ac.be/cedopal/liste-des-abbreviations>); list of available reproductions of the papyrus (sometimes, links to other online resources are given); TM and LDAB numbers (but not linked to the appropriate record)¹⁴².

00052.000

Aesopus, *Fabula* 264, avec traduction latine

PSI 7.848

< 302 >

ed. post.: Lowe in CLA 3.291 ed. post.: J. Kramer in C. Gloss. Bil. 2.10

Medinet el-Fayoum (acquis.) TV (éd.: III/TV Pack2)

→ grec (↓ latin)

Bibl.: G. Goetz, *Corpus Glossariorum Latinerum*, 3.45–46; Cavaenale, CPL 39; F. Della Corte, *Att. XI C.I.P.* (Milan, 1966) 542–550;

Cavallo, *Scrittura* 171; S. Ammirati, *Sul libro latino antico* (Pise-Rome, 2015) 49, 50, 51, 53, 66

Reprod.: Lowe, CLA 3.291; CD PLBML; [PSI online](#)

LDAB: 138; Trismegistos: 59043

While a printed third edition of the whole catalogue is announced¹⁴³, new select outcomes of the cataloguing work are being published online, on the CEDOPAL website, as embedded PDF files, flanked by the bibliographical resources that we have already described: Jew and Christian papyri; Jew and Christian authors of the I–III centuries; Didymus Caecus; Greek Christian letters with literary character (by N. Carlig); Greek and Latin Christian school papyri; Herculaneum Latin papyri (by G. Nocchi Macedo, 2010); medical petitions and reports (by A. Ricciardetto, 2010); private letters with medical character (by A. Ricciardetto, 2010)¹⁴⁴. As already mentioned, the iatromagical papyri have been catalogued by Magali de Haro Sanchez both online (2004: <http://web.philo.ulg.ac.be/cedopal/papyrus-iatromagiques>) and in print (2014)¹⁴⁵.

The most remarkable outcome of this huge project is therefore, as we already noted apropos of the CEDOPAL bibliographies, the rich interplay between digital resources and printed products. Stemming, in most cases, from earlier paper tools, digital repositories are not always to be restricted within virtual boundaries, but can prove fundamental in the production of a more traditional (and, for someone, more reassuring...) paper scholarship (see above, § 2.5). As Marie-Hélène Marganne herself put it,

si l’informatique a révolutionné le stockage, l’édition et les échanges d’informations, nous restons les héritiers d’une tradition livresque qui puise ses racines en Égypte, il y a 5000 ans ..., et l’on n’a pas fini de s’interroger sur les interactions entre la pensée, son expression, et la forme du support qui accueille sa trace écrite, ainsi qu’aux conséquences inévitables qu’entraîne toute modification de ces paramètres sur la formulation des connaissances, leur transmission et leur conservation¹⁴⁶.

The other comprehensive literary catalogue is the *Leuven Database of Ancient Books* (LDAB)¹⁴⁷. The main difference with M-P³, which is older as concept but more recent as development¹⁴⁸, is that LDAB was not conceived to be an updated/extended digital substitute of Pack² and other similar catalogues (e.g. Van Haelst’s *Catalogue des papyrus littéraires juifs et chrétiens*¹⁴⁹), but – in its creator Willy Clarysse’s words – “rather an attempt to collect the basic information on all remains of Greek and Latin books dating before 800 AD”¹⁵⁰. The main focus is overtly not on literature but on books as material

and cultural products: therefore, e.g., literary quotations in documents are excluded, and anthologies are considered under a single entry¹⁵¹. Moreover, bibliography is basic, not as detailed as M-P³. Conversely, the information fields are more detailed as regards physical, material, palaeographical and cultural aspects: material, book form, recto/verso, reuse, columns, pagination, language/script, culture (i.e. cultural category, e.g. science), genre, religion, palaeographical studies are carefully recorded. Of course, the literary/philological side is not neglected: we do find information about author name, book, quotations, other attested authors, linked to *TM Authors* (see below, § 3.3). Date is provided as both century and year, or year span. Provenance is linked to *TM Places* (see below, § 3.3). Bibliography, literature, and reference to published or online pictures are always given. All editions are listed, and reference to the other catalogues is given: TM, M-P³, Nestle-Aland, HGV, but also the *Catalogue of Paraliterary Papyri* (see below, § 8.6). All fields are searchable, even in combination¹⁵².

id	LDAB 1998.1116	
catalogues	Pack 1756.0	
authorname	Hermesianax	
book	Elegy: tatoo poem	
quotation		
provenance	Egypt, Hibeh?	
date	BC 2	
material	papyrus cartonnage	columns 3
verso	on the recto; on the back traces of a document	pagination
bookform	roll	
studies: palaeogr. codicol.		
studies: literature	J.M. Bremer - M. Huys, ZPE 92 (1992), p. 118-120; S.R. Slings, ZPE 98 (1993), p.	
reperiores		
text type		
culture	literature	
genre	poetry, lyric, elegy	
religion	Classical	language Greek
inventory	Paris, Sorbonne 2254 + Bruxelles, Musées Royaux B. 8934	
edition	M. Papathomopoulos, Recherches Pap. 2 (1962), p. 99-111; M. Huys, P. Brux. Gr. 2 22 (1991); Suppl. Hell. 970	
plates		
archive		

LDAB was released in 1998 on a CD-ROM¹⁵³ (picture above), which was equipped with an interesting program able to draw charts and graphs from the recorded data¹⁵⁴. The pathbreaking nature of such a tool was immediately recognized: it was the very first sample of a digital catalogue of literary texts, with obvious benefits in terms of rapidity and usability¹⁵⁵. Shortly later on, in 2001, the *FileMaker* database was published online on the servers of the Leuven University alongside an updated CD version, and since 2006 is fully integrated in the *Trismegistos* platform (<http://www.trismegistos.org/ldab>, see below, § 3.3). The fields are somehow more articulated than the original version (see comparison in the pictures below) and the graph function can still be found, from the left menu (“Create graphs”¹⁵⁶). This maintains the strong interest in ancient readership, giving useful overviews of “book” trends and diffusion, of course on the ground of the known data¹⁵⁷. Just as M-P³, LDAB gives unique numbers as identifiers of the records¹⁵⁸; a document can thus be

called – instead of a long edition name like P.BruX. II 22 plus re-editions and so on – just as M-P³ 0461.11 or LDAB 1116. After this number, it is possible to perform a direct search in the LDAB, calling up the desired record; otherwise, it is necessary to perform an “Advanced search”. The results will be listed in one or more pages, and it must be noted the possibility to sort them in various different ways (ascending or descending by any field) with appropriate commands in the search mask. Each item points to the appropriate LDAB record.

[illegible]

This searchpage allows you to select records from the TDAB that match a given value for up to 5 fields. If you want to use less than 5 conditions, just leave the inputfields blank. Conditions with blank inputfields will be ignored.



Select one of more fields in the list below
(windows users hold down the Control key while clicking. Macintosh users hold down the command key)

catalogues	▼
inventory	▼
maintenance	▼
data	▼
material	▼
menu	▼

(make sure that you select the field to you want to use for searching and linking.)

where is like

and is like

and is like

and is like

and is like

order by don't sort

note: you do NOT have to add the percentage sign (%). It is added automatically to the start and end of your searches.

As in the case of M-P³, the collected data is not destined to stay statically restricted to the catalogue, and used only for comparison and reference, to find and cite a text or to perform background statistical researches. It can be active part of scholarship. In 2003, for example, Teresa Morgan published on *Chronique d'Égypte* an article about *Tragedy in the Papyri*, with the significant subtitle of *An Experiment in Extracting Cultural History from the Leuven Database*¹⁵⁹. The author describes how she used LDAB data to draw patterns of reading and literary culture in ancient Egypt. The attempt is admittedly a “tentative picture”¹⁶⁰, because statistical reconstructions based on dispersed fragments are always dangerous (see below, §§ 8.2 and 9), and this is certainly a limit to the use of such tools as databases and catalogues to reach comprehensive overviews. It seems to be more focused an attempt like that made the same year by Amphiloichios Papathomas, who extracted from LDAB data about papyri with scholia (producing a catalogue of scholiographic papyri, in a sense) and analysed cases and typologies¹⁶¹.

3.3 Thrice Greatest *Trismegistos*

Trismegistos (TM, <http://www.trismegistos.org>), named after the famous late epithet of Hermes/Thoth, the Graeco-Egyptian god of wisdom and writing, is defined as “an interdisciplinary platform for ancient world texts and related information”¹⁶². When it was created, in 2005 (launched in November 2006), it was essentially a catalogue of information (metadata) about published papyrological texts from Graeco-Roman Egypt. It was designed to overcome

the intrinsic limits of HGV, LDAB, and similar resources, which are oriented to a schematic division between ‘documents’ and ‘literature’ (see below, § 3.4) and focused exclusively on Greek and Latin texts. In fact, TM was the major outcome of the project “Multilingualism and Multiculturalism in Graeco-Roman Egypt”, conducted by Mark Depauw at the University of Köln with the aim of investigating language shifts in relation to cultural identity. Indeed, it was originally conceived as an online database of Graeco-Roman papyrological material in Egyptian scripts, parallel to and in close cooperation with HGV and LDAB. On the basis of this new platform, factors influencing language preferences would then be analysed. Thus the digital catalogues called *Demotic and Abnormal Hieratic Texts* (DAHT) and *Hieroglyphic and Hieratic Papyri* (HHP) were built up, stemming from databases of Demotic papyri and literature already compiled by H.-J. Thissen at the University of Köln (see above, § 2.2) and based on the technical infrastructure of the *Prosopographia Ptolemaica Online* hosted at Leuven¹⁶³.

The subsequent phase is best described in the TM historical page:

Building on these databases also raised a number of questions: Why include only papyrological texts? The evidence of inscriptions is equally valuable for the study of shifting language preferences, and in Egyptology there is no strict disciplinary boundary between epigraphy and papyrology. Why separate Egyptian language and scripts from Greek and Latin? They were spoken in the same region at the same time, and occur together on a sizeable amount of texts. Mapping this overlap would be easier if everything was in a single database. Why limit the database to the Graeco-Roman period? Demotic starts in the 7th cent. BC and the hiatus in the documentation of the 3rd Intermediate Period, around 800 BC, seemed a better terminus post quem. Greek also continues to [be] used in the Byzantine period, and AD 800 seemed more suitable here. In view of these considerations, we decided to set up partnerships with HGV and LDAB, and merge everything into a single database. We mapped the overlap between Greek papyrological and egyptological databases, gave everything a unique numeric id (the TM number), and established criteria for what made out a record in the database and was given a separate number. Doing this obliged us to set strict standards for standardization of metadata, often through the use of numbers establishing links with related databases for different types of information¹⁶⁴.

This unique numerical identifier is perhaps the utmost relevance of TM in the scenario of Digital Papyrology. By assigning a ‘TM number’¹⁶⁵ to each document recorded, it easily overcomes the bibliographical inconsistencies that we highlighted in the previous chapter (esp. § 2.4), and fosters cross-platform compatibility and integration between different digital representations of ancient texts, settling a universal, uniform and truly (etymologically) ‘digital’ standard¹⁶⁶. This is obviously not as user-friendly as papyrological abbreviations, since it is somehow easier and more straightforward to remember, cite, and retrieve ‘O.Stras. I 764’ than ‘TM 76345’¹⁶⁷, but much of the issues described in the previous part are solved by providing one single call number to each document stored in HGV, LDAB, M-P³, etc., regardless for traditional or idiosyncratic conventions – to which, nonetheless, TM brings a significant contribution, since its papyrological

abbreviations are almost completely different than those of the other resources¹⁶⁸. The TM ID acts also as a stable URL identifier and can be used to point directly to a record, e.g. www.trismegistos.org/text/12345 for TM ID 12345 (which is used by HGV itself for its own URLs as well: <http://aquila.zaw.uni-heidelberg.de/hgv/12345>).

Therefore, this is the first and foremost reason for which TM is ‘greatest’. The second reason lies in the integrated network of so many earlier or new databases. TM has become a big aggregator of metadata¹⁶⁹, absorbing and adapting to its framework many different resources and metadata, either already existing or freshly developed. The first are the two catalogues of Egyptian texts that we just mentioned (DAHT, launched in 2006 at <http://www.trismegistos.org/daht>, to which metadata of Demotic literary texts were added for LDAB, and HHP, launched in 2007 at <http://www.trismegistos.org/hhp>). Then (in 2006) came the integration with HGV and LDAB, as well as with a database of Coptic documentary texts which had been created by Alain Delattre (Université Libre de Bruxelles) on the model of HGV: the *Brussels Coptic Database* (BCD¹⁷⁰, a.k.a. *Banque de données des textes coptes documentaires*). One year later also the *Arabic Papyrology Database* (APD¹⁷¹) was integrated (along with Coptic metadata for LDAB). APIS is also providing metadata to TM. While BCD and APD live independent lives also outside TM, to which they provide regular updates¹⁷², DAHT, HHP, and LDAB are part of the very same platform.

Also embedded is *TM Magic* (<http://www.trismegistos.org/magic>), the first thematic metadata database hosted by *Trismegistos* as of 2007 and edited by Franziska Naether (Leipzig) and Mark Depauw with the aim of filling a gap between projects like LDAB, HGV, and BCD, for a textual category of difficult and uneasy definition: religious, ritual, magical and divinatory texts¹⁷³. Another embedded thematic catalogue is ATE (*Aramaic Texts from Egypt*, <http://www.trismegistos.org/ate>), developed by A. Schütze (München) as of 2007. The integration with a forthcoming metadata catalogue of the Greek and Latin inscriptions of Egypt, called IGLE (*Inscriptions Grecques et Latines d’Egypte*), edited by Paul Heilporn and Alain Martin, is announced¹⁷⁴.

The items catalogued in these thematic databases do show up in TM too (i.e. *TM Texts*, the main core database¹⁷⁵), with links to the partner resources, which usually offer a more detailed set of information, focused on the particular category of texts they deal with. Look for example at the following case: a bilingual magical text catalogued in TM, but also in LDAB, DAHT and *TM Magic*. Each database offers somewhat different information, but links are provided to each other, and the numerical ID is unique: 55954.

Links to the embedded catalogues are displayed in red buttons also in the list of the search results; links to external resources are displayed in different colours. See below a case of a bilingual documentary papyrus: alongside DAHT, external links to HGV and *Papyri.info* are provided, and a text



TM Texts
TRINITY MUSEUM

Search:

Google Custom Search

TM Texts

TM Home

About

Contact

write and publish TM numbers:
www.trinitymuseum.org/text/2700

QUICKSEARCH

Trinitymuseum no...

+ Advanced Search (Error)

TM HOME

Introduction

Use and Coverage

Reliabilis

Language and Scripts

Stable Identifiers

Data Standards

Database structure

History

Help and

COLLECTIONS INFO

Briefly: Shortlisted Museum

Full: Registered Museum

Briefly: Shortlisted Museum

AUTHORITY INFO

When created

PLACES INFO

Places mentioned in P. Bürgsch. 13 No [A]

PEOPLE INFO

People mentioned in P. Bürgsch. 13 No [A]

P. Bürgsch. 13 bis [A] (Sethe, Kurt / Patsch, Josef)
= P. Cairo 3 50162 descr. (Spiegelberg, Wilhelm)
= P. Fleph. Gr. 16 (Rubensohn, O.)
= P. Fleph. Dem. 2 (Spiegelberg, Wilhelm)

Trinitymuseum no.	2700
Publication	P. Bürgsch. 13 bis [A], introduction by Goetz, Sethe, Kurt / Patsch, Josef, 1970
Inventory	Berlin, Staatliche Museen 3, 1553
Other inventory nos.	Cairo, Egyptian Museum 315, 167 former Berlin, Staatliche Museen 3 512 (= 1553)
Related inv. list	
Material	paper
Material form	
Script type	dem. cursive
Script code	
Language script	Demotic Greek
Language code	Demotic, along with Greek, common
Numbering	1. no. 100, 2. no. 101, 3. no. 102, 4. no. 103, 5. no. 104, 6. no. 105, 7. no. 106, 8. no. 107, 9. no. 108, 10. no. 109, 11. no. 110, 12. no. 111, 13. no. 112, 14. no. 113, 15. no. 114, 16. no. 115, 17. no. 116, 18. no. 117, 19. no. 118, 20. no. 119, 21. no. 120, 22. no. 121, 23. no. 122, 24. no. 123, 25. no. 124, 26. no. 125, 27. no. 126, 28. no. 127, 29. no. 128, 30. no. 129, 31. no. 130, 32. no. 131, 33. no. 132, 34. no. 133, 35. no. 134, 36. no. 135, 37. no. 136, 38. no. 137, 39. no. 138, 40. no. 139, 41. no. 140, 42. no. 141, 43. no. 142, 44. no. 143, 45. no. 144, 46. no. 145, 47. no. 146, 48. no. 147, 49. no. 148, 50. no. 149, 51. no. 150, 52. no. 151, 53. no. 152, 54. no. 153, 55. no. 154, 56. no. 155, 57. no. 156, 58. no. 157, 59. no. 158, 60. no. 159, 61. no. 160, 62. no. 161, 63. no. 162, 64. no. 163, 65. no. 164, 66. no. 165, 67. no. 166, 68. no. 167, 69. no. 168, 70. no. 169, 71. no. 170, 72. no. 171, 73. no. 172, 74. no. 173, 75. no. 174, 76. no. 175, 77. no. 176, 78. no. 177, 79. no. 178, 80. no. 179, 81. no. 180, 82. no. 181, 83. no. 182, 84. no. 183, 85. no. 184, 86. no. 185, 87. no. 186, 88. no. 187, 89. no. 188, 90. no. 189, 91. no. 190, 92. no. 191, 93. no. 192, 94. no. 193, 95. no. 194, 96. no. 195, 97. no. 196, 98. no. 197, 99. no. 198, 100. no. 199, 101. no. 200, 102. no. 201, 103. no. 202, 104. no. 203, 105. no. 204, 106. no. 205, 107. no. 206, 108. no. 207, 109. no. 208, 110. no. 209, 111. no. 210, 112. no. 211, 113. no. 212, 114. no. 213, 115. no. 214, 116. no. 215, 117. no. 216, 118. no. 217, 119. no. 218, 120. no. 219, 121. no. 220, 122. no. 221, 123. no. 222, 124. no. 223, 125. no. 224, 126. no. 225, 127. no. 228, 128. no. 229, 129. no. 230, 130. no. 231, 131. no. 232, 132. no. 233, 133. no. 234, 134. no. 235, 135. no. 236, 136. no. 237, 137. no. 238, 138. no. 239, 139. no. 240, 140. no. 241, 141. no. 242, 142. no. 243, 143. no. 244, 144. no. 245, 145. no. 246, 146. no. 247, 147. no. 248, 148. no. 249, 149. no. 250, 150. no. 251, 151. no. 252, 152. no. 253, 153. no. 254, 154. no. 255, 155. no. 256, 156. no. 257, 157. no. 258, 158. no. 259, 159. no. 260, 160. no. 261, 161. no. 262, 162. no. 263, 163. no. 264, 164. no. 265, 165. no. 266, 166. no. 267, 167. no. 268, 168. no. 269, 169. no. 270, 170. no. 271, 171. no. 272, 172. no. 273, 173. no. 274, 174. no. 275, 175. no. 276, 176. no. 277, 177. no. 278, 178. no. 279, 179. no. 280, 180. no. 281, 181. no. 282, 182. no. 283, 183. no. 284, 184. no. 285, 185. no. 286, 186. no. 287, 187. no. 288, 188. no. 289, 189. no. 290, 190. no. 291, 191. no. 292, 192. no. 293, 193. no. 294, 194. no. 295, 195. no. 296, 196. no. 297, 197. no. 298, 198. no. 299, 199. no. 300, 200. no. 301, 201. no. 302, 202. no. 303, 203. no. 304, 204. no. 305, 205. no. 306, 206. no. 307, 207. no. 308, 208. no. 309, 209. no. 310, 210. no. 311, 211. no. 312, 212. no. 313, 213. no. 314, 214. no. 315, 215. no. 316, 216. no. 317, 217. no. 318, 218. no. 319, 219. no. 320, 220. no. 321, 221. no. 322, 222. no. 323, 223. no. 324, 224. no. 325, 225. no. 326, 226. no. 327, 227. no. 328, 228. no. 329, 229. no. 330, 230. no. 331, 231. no. 332, 232. no. 333, 233. no. 334, 234. no. 335, 235. no. 336, 236. no. 337, 237. no. 338, 238. no. 339, 239. no. 340, 240. no. 341, 241. no. 342, 242. no. 343, 243. no. 344, 244. no. 345, 245. no. 346, 246. no. 347, 247. no. 348, 248. no. 349, 249. no. 350, 250. no. 351, 251. no. 352, 252. no. 353, 253. no. 354, 254. no. 355, 255. no. 356, 256. no. 357, 257. no. 358, 258. no. 359, 259. no. 360, 260. no. 361, 261. no. 362, 262. no. 363, 263. no. 364, 264. no. 365, 265. no. 366, 266. no. 367, 267. no. 368, 268. no. 369, 269. no. 370, 270. no. 371, 271. no. 372, 272. no. 373, 273. no. 374



TM Texts
TRINOMIAL

Search:

Google:

TM Texts

TM Home

About

Contact

Website and (public) TM resources:
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QUICKSEARCH

Trinomialtext no...

+ Advanced Search (Error)

TM HOME

Introduction

Use and Coverage

Reviews

Languages and scripts

Stable Identifiers

Data Standards

Database structure

History

Help and

COLLECTIONS INFO

Briefly: Shortlist of Manuscripts

Full: Egyptian Manuscripts

Briefly: Shortlist of Manuscripts

AUTHORS INFO

Which project

PUBLICATIONS

Manuscripts mentioned in P. Bürgsch. 13 No. 14

PROJECT INFO

Manuscripts mentioned in P. Bürgsch. 13 No. 14

P. Bürgsch. 13 bis 14 [A] (Sethe, Kurt / Patsch, Josef)

= P. Cairo 3 50162 descr. (Spiegelberg, Wilhelm)

= P. Fleph. Gr. 16 (Rubensohn, O.)

= P. Fleph. Dem. 2 (Spiegelberg, Wilhelm)

Trinomialtext ID: 2700

Publication: P. Bürgsch. 13 bis 14, in: *Association for Greek, Sethe, Kurt / Patsch, Josef*, 1927a

Inventory: Berlin, Staatliche Museen 3, 1553

Other inventory nos.: Cairo, *gyptian Museum* 314, 167

former Berlin, Staatliche Museen 3 512 (= 1553)

Related to: 1-17

Material: papyrus

Material form:

Script type:

Script content:

Classification:

Language(s) written: Hieroglyph, Demotic, Greek

Language(s) used: Hieroglyph, Demotic, Greek, Coptic, Papyrus

1. Hieroglyph: *Spiegelberg, O.*, 1927a, 1927b, 1927c, 1927d, 1927e, 1927f, 1927g, 1927h, 1927i, 1927j, 1927k, 1927l, 1927m, 1927n, 1927o, 1927p, 1927q, 1927r, 1927s, 1927t, 1927u, 1927v, 1927w, 1927x, 1927y, 1927z, 1928a, 1928b, 1928c, 1928d, 1928e, 1928f, 1928g, 1928h, 1928i, 1928j, 1928k, 1928l, 1928m, 1928n, 1928o, 1928p, 1928q, 1928r, 1928s, 1928t, 1928u, 1928v, 1928w, 1928x, 1928y, 1928z, 1929a, 1929b, 1929c, 1929d, 1929e, 1929f, 1929g, 1929h, 1929i, 1929j, 1929k, 1929l, 1929m, 1929n, 1929o, 1929p, 1929q, 1929r, 1929s, 1929t, 1929u, 1929v, 1929w, 1929x, 1929y, 1929z, 1930a, 1930b, 1930c, 1930d, 1930e, 1930f, 1930g, 1930h, 1930i, 1930j, 1930k, 1930l, 1930m, 1930n, 1930o, 1930p, 1930q, 1930r, 1930s, 1930t, 1930u, 1930v, 1930w, 1930x, 1930y, 1930z, 1931a, 1931b, 1931c, 1931d, 1931e, 1931f, 1931g, 1931h, 1931i, 1931j, 1931k, 1931l, 1931m, 1931n, 1931o, 1931p, 1931q, 1931r, 1931s, 1931t, 1931u, 1931v, 1931w, 1931x, 1931y, 1931z, 1932a, 1932b, 1932c, 1932d, 1932e, 1932f, 1932g, 1932h, 1932i, 1932j, 1932k, 1932l, 1932m, 1932n, 1932o, 1932p, 1932q, 1932r, 1932s, 1932t, 1932u, 1932v, 1932w, 1932x, 1932y, 1932z, 1933a, 1933b, 1933c, 1933d, 1933e, 1933f, 1933g, 1933h, 1933i, 1933j, 1933k, 1933l, 1933m, 1933n, 1933o, 1933p, 1933q, 1933r, 1933s, 1933t, 1933u, 1933v, 1933w, 1933x, 1933y, 1933z, 1934a, 1934b, 1934c, 1934d, 1934e, 1934f, 1934g, 1934h, 1934i, 1934j, 1934k, 1934l, 1934m, 1934n, 1934o, 1934p, 1934q, 1934r, 1934s, 1934t, 1934u, 1934v, 1934w, 1934x, 1934y, 1934z, 1935a, 1935b, 1935c, 1935d, 1935e, 1935f, 1935g, 1935h, 1935i, 1935j, 1935k, 1935l, 1935m, 1935n, 1935o, 1935p, 1935q, 1935r, 1935s, 1935t, 1935u, 1935v, 1935w, 1935x, 1935y, 1935z, 1936a, 1936b, 1936c, 1936d, 1936e, 1936f, 1936g, 1936h, 1936i, 1936j, 1936k, 1936l, 1936m, 1936n, 1936o, 1936p, 1936q, 1936r, 1936s, 1936t, 1936u, 1936v, 1936w, 1936x, 1936y, 1936z, 1937a, 1937b, 1937c, 1937d, 1937e, 1937f, 1937g, 1937h, 1937i, 1937j, 1937k, 1937l, 1937m, 1937n, 1937o, 1937p, 1937q, 1937r, 1937s, 1937t, 1937u, 1937v, 1937w, 1937x, 1937y, 1937z, 1938a, 1938b, 1938c, 1938d, 1938e, 1938f, 1938g, 1938h, 1938i, 1938j, 1938k, 1938l, 1938m, 1938n, 1938o, 1938p, 1938q, 1938r, 1938s, 1938t, 1938u, 1938v, 1938w, 1938x, 1938y, 1938z, 1939a, 1939b, 1939c, 1939d, 1939e, 1939f, 1939g, 1939h, 1939i, 1939j, 1939k, 1939l, 1939m, 1939n, 1939o, 1939p, 1939q, 1939r, 1939s, 1939t, 1939u, 1939v, 1939w, 1939x, 1939y, 1939z, 1940a, 1940b, 1940c, 1940d, 1940e, 1940f, 1940g, 1940h, 1940i, 1940j, 1940k, 1940l, 1940m, 1940n, 1940o, 1940p, 1940q, 1940r, 1940s, 1940t, 1940u, 1940v, 1940w, 1940x, 1940y, 1940z, 1941a, 1941b, 1941c, 1941d, 1941e, 1941f, 1941g, 1941h, 1941i, 1941j, 1941k, 1941l, 1941m, 1941n, 1941o, 1941p, 1941q, 1941r, 1941s, 1941t, 1941u, 1941v, 1941w, 1941x, 1941y, 1941z, 1942a, 1942b, 1942c, 1942d, 1942e, 1942f, 1942g, 1942h, 1942i, 1942j, 1942k, 1942l, 1942m, 1942n, 1942o, 1942p, 1942q, 1942r, 1942s, 1942t, 1942u, 1942v, 1942w, 1942x, 1942y, 1942z, 1943a, 1943b, 1943c, 1943d, 1943e, 1943f, 1943g, 1943h, 1943i, 1943j, 1943k, 1943l, 1943m, 1943n, 1943o, 1943p, 1943q, 1943r, 1943s, 1943t, 1943u, 1943v, 1943w, 1943x,

TRISMEGISTOS

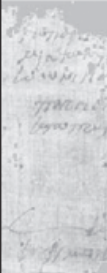
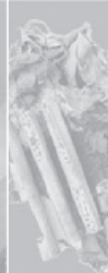
An interdisciplinary portal of papyrological and epigraphical resources
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						BIBLIOGRAPHY				
TEXTS	COLLECTIONS	ARCHIVES	PEOPLE	PLACES	AUTHORS	GHOSTNAMES				
						 NEW A guide for first time users Trismegistos Online Publications Downloads <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Partners</td> <td>Funding</td> </tr> <tr> <td>About</td> <td>Contact</td> </tr> </table>  Facebook  Blogger	Partners	Funding	About	Contact
Partners	Funding									
About	Contact									

TM Archives (<http://www.trismegistos.org/arch>) is built on the earlier *Leuven Homepage of Papyrus Archives* (LHPA) created by Willy Clarysse and Katelijn Vandorpe to collect references to ancient collections of texts, as part of their own research interests in the topic¹⁷⁷. For many archives it is available a downloadable PDF with further details and bibliography, and for all of them a list of the pertaining documents is given.

TM People (<http://www.trismegistos.org/ref>) is a database of personal references in the papyri¹⁷⁸, based on the earlier *Prosopographia Ptolemaica* (*ProsPtol*) Online. The latter was the electronic version of the well-known prosopographical series of the same name launched by Willy Peremans and Edmond Van 't Dack as of 1950, being a collection of information on all individuals with a title living in Ptolemaic Egypt and neighbouring regions attested in Greek, Egyptian and Latin literary and documentary (papyrological, epigraphical) sources¹⁷⁹. The digitisation of these prosopographical inventories started in 1982 and led to two relational *FileMaker* databases, one (PER) for individuals and one (REF) for all references to these individuals: so, e.g., the numerous attestations of Zenon in REF could be reduced to a single person in PER¹⁸⁰. The database used to include also search engines for family relations (FAM), functions (FU), texts (TEX), places (GEO & GEOREF)¹⁸¹. It was indeed this relational architecture (see below), together with its reliance on sources of different genres and in different languages, that provided the technical and conceptual framework for the entire *Trismegistos* project. *ProsPtol*, edited by W. Clarysse, M. Depauw, H. Hauben, L. Mooren, and K. Vandorpe, and hosted at <http://prospitol.arts.kuleuven.ac.be> since 2002, flowed into *TM People* in 2005. Subsequently, a process called Named Entity Recognition (NER), a computer-aided method of tracing personal names and genealogical connections, was applied by Bart Van Beek and Mark Depauw to the *Papyri.info* textual

database (through the selection of capitalized words, appropriate word endings, etc.), in order to extract the relevant information and thus expanding the prosopographical database to include all papyrus texts¹⁸².

TM People is now a threefold databank. In the *Names* section (NAM) one can search for a Greek, Demotic, Coptic, or Latin name (or part of a name), or for sets of names according to specific criteria (language/script, divine element, grammatical type). In the *Persons* section (PER) it is possible to look up specific individuals by entering a combination of name, patronymic and metronymic (and century), or directly the numerical IDs assigned by the *ProsPtol*. The *References* section (REF) is a database of people attestations where it is possible to search for a set of personal attestations in the papyri, i.e. all attestations of Demotic renderings of Apollonios or all attestations of Greek names in Demotic. For instance, let us search for the female Egyptian name Taphorsais. In NAM we first learn that it is a transliteration variant of Tnephersais, original T3-Nfr-š3y, rendered in Greek as Τνεφερσαις:

The screenshot shows the 'Trismegistos People (NAM)' search results page. The page has a header with the 'Tm' logo and 'Trismegistos People (NAM)'. Below the header, there are tabs for 'People', 'Documents', 'Dates', and 'Geography'. The 'People' tab is selected. On the left, there is a sidebar with 'QUICKSEARCH' and 'PEOPLE' sections. The 'QUICKSEARCH' section includes links for 'Name info (test)...', 'Name ID (number)...', 'Advanced Search (PAP)', and 'Advanced Search (PER)'. The 'PEOPLE' section includes links for 'Home', 'List all names', 'Search for people', and 'Search for names'. The 'TM PEOPLE INFO' section includes links for 'Introduction', 'Name of Change', 'Quality Control', 'Prosopography', 'Transliteration of Egyptian', 'Greek transliteration', and 'Names and Nouns to...'. The main content area shows 'Names: search results' with a message 'Number of results matching your search: 1 [Click the @ to see more details for a name]. How to export the data from this query'. Below this is a table with columns: Variant, TM Num, Name, Greek, Egyptian, Latin, and Coptic. The table contains one row for 'Taphorsais', which is a transliteration variant of 'Tnephersais' (TM Num 1433). The Greek name is 'Τνεφερσαις', the Egyptian name is 'T3-Nfr-š3y', and the Latin name is 'Taphorsais'.

Variant	TM Num	Name	Greek	Egyptian	Latin	Coptic
@ Taphorsais transliteration variant of:	1433	Tnephersais	Τνεφερσαις	T3-Nfr-š3y		

If we click on the '+' on the left, we learn more information about the original name (meaning, origin, bibliography...), its attestations in the documents, chronological and geographical attestation graphs, its position in the onomastic network (see below, § 7.2), a list of all the attested spelling variants:

[illegible]

The attestations of both the original form and the variants are hyperlinked to detailed tables of attestations, which can be sorted (e.g. by date) and are further connected to the texts where the name occurs:


Trismegistos People

[People](#)
[TM Home](#)
[About](#)
[Contact](#)

QUICKSEARCH
Name (in Text)...
Name ID (number)...
PER ID (number)...

TM PEOPLE
Home
List of names
Search for people
Search for names
TM PEOPLE INFO
Introduction
Current Coverage
Quality Control
Onomastography
Transliteration of Egyptian
Names and Variants
Stable Identifiers
Latin and other
polyglot names
Systems
Help us!

Tnephersnis

> Egyptian name, female (More information...)

Page 1 of 4

This name is attested 274 time(s) as main, double or triple name (Sort order: chronological):

REF. [A]	Name	Person ID [A]	Date [A]	Place	Full Text
P. Coit. 53, 53	Tnephersnis	37134	BC 170 - 145	Egypt, 011 - Hyksos (Shubt), Nile (found) Egypt, 013 - Thebes (written)	
SB 20 14478, 11	Tnephersnis	162484	BC 159 Aug 20	Egypt, 00 - Amarna (Theban)	PH
SB 20 14477, 25	Tnephersnis	162356	BC 159 Aug 21 after	Egypt, 00 - Amarna (Theban)	PH
Stud. diss. d. orient. 1501, 21 (1972), p. 349 no. 23	Tnephersnis	37585	BC -16 - 132	Egypt, Western desert - Oases (written)	
P. Berol. 1100, 1, 6	Tnephersnis	37688	BC 131 Mar 14 shortly after	Egypt, 00 - Amarna (Theban)	PH
UR 2 2 180 a, col. 45, 10	Tnephersnis	152841	BC 113 Jul 25	Egypt, 00 - Amarna (Theban)	PH
Short Text 2 127, 6 - 8	Tnephersnis	71688	BC 99 Aug 18	Egypt, 00 - Amarna (Theban)	
SB 14 11933, 7	Tnephersnis	110400	BC 27 Nov 19	Egypt, 00 - Thebes (Theban)	PH
P. Berol. 1100, 1, 6	Tnephersnis	271891	AD 1 - 99	Egypt (found & written)	PH
P. Louvre 1 100 decr. col. 1, 8	Tnephersnis	211239	AD 1 - 299	Egypt, 00 - Thebes (Theban)	PH
P. Berol. 1100, 1, 6	Tnephersnis	210621	AD 8 Aug 20 - 9 Aug 28	Egypt, 00 - Thebes (Theban)	PH
P. Berol. 1100, 1, 6	Tnephersnis	118236	AD 11 Jul 14 - 26	Egypt, 00 - Thebes (Theban)	PH
P. Berol. 1100, 1, 6	Tnephersnis	310341	AD 63 Dec 8	Egypt, 00 - Thebes (Theban)	PH
P. L. Berol. 1100, 1, 6	Tnephersnis	111923	AD 75 - 99	Egypt, 013 - Thebes (Theban)	PH
P. Berol. 1100, 1, 6	Tnephersnis	261183	AD 91 Jul 1	Egypt, 013 - Thebes (Theban)	PH

A very recent (2014) implementation of this onomastical database is *TM Ghostnames* (<http://www.trismegistos.org/ghostnames>), where Chris Eyckmans and Willy Clarysse collected all personal names (or name variants) that have been incorrectly spelled by scribes, erroneously read by editors of papyri or wrongly copied by compilers of indexes, and are thus in fact non-existent. The names (both Greek and Demotic) are classed in several typologies according to the kind of error and can be browsed or searched by fields (ghostname, correct name, responsible for the error, corrector, typology). Of each name is also given the reference to the papyrus edition where it occurs, and bibliographical information on the correction. This database is a particularly interesting tool because it admittedly serves as a complementary update for the existing printed onomastical lexica (namely Preisigke's 1922 *Namenbuch* and Foraboschi's 1967 *Onomasticon Alterum Papyrologicum*¹⁸³), which very often record the not yet corrected form¹⁸⁴. This catalogue appears to be the online evolution of a *FileMaker* database, developed by Willy Clarysse and Jeroen Clarysse and called *Ghostbuster*, which was released as a stand-alone shareware software several years ago (it was presented at the 20th International Congress of Papyrology at

Copenhagen, in 1992¹⁸⁵). For other prosopographical databases see below, § 4.4.

TM Places (<http://www.trismegistos.org/geo>) expands the geographical database of the *Fayum Project*, a former research project (1998–2002) by W. Clarysse and K. Vandorpe, being a topographical information database about ancient Arsinoites (Fayum)¹⁸⁶. This earlier database is still working at <http://www.trismegistos.org/fayum>: alongside summary information and bibliography about each village, it offers detailed descriptions of most villages, with links to TM (formerly, it was interconnected with *ProsPtol*, LDAB, and LHPA). When the ancient location is known, a link to *Google Maps* is given; some villages are also plotted on a map specifically drawn for the project itself. *TM Places*, on another hand, contains the attestations of toponyms of whichever kind in texts from all Egypt (GEOREF, inherited from *ProsPtol*), but is also linked to the provenance field in *TM Texts* (GEO), and is being extending to all ancient places, even outside Egypt¹⁸⁷. Several search methods are possible, and detailed guidelines explain how to use this powerful tool at best. Places are plotted on *Google Maps* here too, in a georeferencing system that partially recalls the suggestions advanced in 2005 by Katja Mueller, who praised the advantages of using *Geographic Information System* (GIS) software as a cartographic and analytical tool in Papyrology, for representing and understanding spatial patterns from data¹⁸⁸. She evoked even a *Geographical Advanced Papyrological Information System* (GAPIS) that could integrate data from HGV, APIS and *ProsPtol* (on the date, TM was still in embryo), though aware of the problems in relating the different papyrological databases to each other, and of the time-consuming effort requested by such a task. Based on the powerful relational architecture of TM, *TM Places* seems a suitable response to that claim.

TM Collections (<http://www.trismegistos.org/coll>) is a catalogue of all modern collections of papyrological and epigraphical documents, searchable in many ways and providing useful information on where documents are preserved (a recent refurbishment has restyled the database with maps, graphs, and better search options). It was formerly known as the *Leuven Homepage of Papyrus Collections* (LHPC), a project by W. Clarysse and H. Verreth stemming from a conference on “Papyrus Collections World Wide”, held at Bruxelles and Leuven in 2000¹⁸⁹. Tracing papyrus collections is rather important in order to reconstruct the modern history of fragments: it is not rare, for example, that fragments coming from the same findspot and later dispersed among different places lead to important reunifications. This database is a key tool for locating places where papyrus fragments are preserved, and to perform quantitative studies¹⁹⁰; for further information, one must refer to the collections catalogues, for which see below (§ 3.6).

More recent are the sections *TM Authors* (<http://www.trismegistos.org/authors>), still in Beta Version, a database of ancient writers and works related to LDAB metadata about ancient authors (attestations, quotations, etc., see

above), and *TM Editors* (<http://www.trismegistos.org/edit>), an ongoing catalogue of modern scholars taken from the information about editors of TM texts and from the bibliographical records of BP and DL. This was a particularly painstaking tool to build, because of some initial issues in recording the responsibility of papyrus editions (e.g. papyri published by different authors in collective volumes or *Festschriften* were usually recorded under the volume's editor's name), but the information provided by the entire papyrological community via a shared *Google* spreadsheet helped fixing the problem, and now *TM Editors* is a powerful database for any possible study on papyrological editorial practices and trends¹⁹¹.

Of *TM Text Irregularities*, *TM Networks*, and *TM Calendar* we will discuss further on, in the part devoted to the newest trends in Digital Papyrology (§ 7). We shall conclude our survey of the TM-embedded metadata catalogues with some general remarks. Following the TM fashion, each archive, collection, name, person, personal attestation, place, collection, ancient author, modern editor, etc., bears a unique numerical identifier, randomly assigned. This is a significant extension of the standardizing method applied originally to the texts¹⁹². Moreover, it must be stressed that all these catalogues are deeply interrelated with each other, in a huge and ever-growing set of relational databases¹⁹³ that makes TM an interactive network in which it is possible to literally navigate amongst ancient documents as digital objects (see below, § 9). A typical text entry, for example, offers access to the references of the collection(s) holding the document, of the archive(s) to which the document may belong, of the places and names occurring in the document. Moreover, bibliographical entries are all linked to *TM Bib* and DL. Other external resources (mainly *Papyri.info* and HGV, but not only) are linked in a specific metadata section ("Related resources").

The whole *Trismegistos* platform is therefore a powerful source of data for quantitative analysis: see e.g. the graphs automatically provided in *TM Names*, mentioned above. The TM team itself intensively exploits the information stored there in order to produce extensive and comprehensive studies based on the analysis of TM metadata. "[U]sing descriptive statistics to chart the reflection of social and religious changes in name giving in Greco-Roman Egypt"¹⁹⁴ is one consolidated direction. Other case-studies such as chronological, geographical, typological, prosopographical surveys are well represented by the "Trismegistos Online Publications" that I will discuss below (§ 6.6) apropos of digital publications¹⁹⁵. A collective volume is expected on the chronological evolution of language preferences¹⁹⁶. Further steps move towards the network analysis of onomastic information (see below, § 7.2). All of this goes far beyond being a simple reference database for supporting research: in this case too, there is a complex and active interplay with actual scholarship.

The third (but not least) reason for which *Trismegistos* is 'greatest' is its

inclination to expand beyond Papyrology. TM was born as an essentially demoticist (and egyptological) resource, turning immediately to comprising Greek and Latin Papyrology, thus filling a traditional but deplorable rift in the discipline. Coptic, Arabic, and Aramaic papyrologies were considered soon after, and TM became an invaluable and unavoidable tool of Papyrology in its widest meaning, not excluding even inscriptions from Graeco-Roman Egypt. The more recent trends are to extend the documentary ground to other ancient regions (Macedonia, Regio X: Venetia et Histria, Britain...)197 and languages (Meroitic, Messapic, Etruscan, Italic...), and thus to create a global network in ancient studies, with a strong focus on the written document and its linguistic appearance198, which certainly will have a significant place in a desirable, forthcoming (r)evolution in these research fields199.

3.4 Fifty Shades of Papyri, or: What Do We Catalogue?

Cataloguing metadata poses a vital, starting issue: what do we choose as basic data, to which relate all information? As we have seen, data is represented by the papyrological text. And indeed papyri are the basic entry units of all the catalogues surveyed so far: any possible context information stored by HGV, M-P³, LDAB, TM points to a single text, or to a set of single texts. Since the textual state of ancient documents is often complex and articulated (think only of the possible cases of reuse or of composite documents), the problem is therefore apparent: what do we mean with ‘base text unit’?

TM editors clearly felt this problem (“What gets a number?” is the title of a section of the introductory web page) and published a sharp ‘disclaimer’, which is worth quoting extensively.

In principle a Trismegistos number (TM_id) that identifies records in the database corresponds to a single document or book. In the majority of cases no distinction has to be made between a document or book (which is identified by the number), the physical object (e.g. a papyrus) and the text (e.g. a Demotic letter). Frequently, however, several (sub)texts are found together on a single writing surface and then it must be decided whether these all should become individual records with their own TM_id or not.

To determine what constitutes a document or book or inscription (and thus should become a separate record), we have given priority to material aspects: in principle all texts written on what was in antiquity a single writing surface belong together and form one document receiving a single Trismegistos number, unless there are good reasons to believe that the only (and unintended) relation between the two texts is the writing surface itself.

This means that related texts on the same surface are considered a single document, even if the relation is merely that they were written by the same scribe consecutively, but also that related texts which were in antiquity written on separate surfaces are considered separate documents. Even if a single text written by the same scribe and in a single action does not fit on a single papyrus sheet or ostrakon but is continued on another for pure

material reasons, two writing surfaces which were physically separate in antiquity cannot be considered a single document. Exceptions to this rule are rare and have explicitly been marked as such in the Ro/Vo comment field.

In other words the burden of proof rests with the scholar who wants to argue that two texts on the same writing surface belong to different documents because in the scribe's intention they have nothing to do with each other²⁰⁰.

The issue at stake is not secondary, especially with reference to resource integration. Quite fortunately, TM and HGV largely share the same concept of 'text', so that mapping both metadata sets to each other implied just technical problems due to their different software architectures. However, it is not rarely the case that a textual item in the *Duke Databank* coincides to more than one HGV/TM record. For example, P.Bad. IV 83, a letter (probably official) from Ankyron in the Herakleopolites and dated around AD 200, is divided in two columns written by two different hands. Accordingly, TM and HGV keep the two scribal products distinct: the former assigns a different TM number to each column (19336 and 19337 = P. Baden IV 83 col. 1 and 2 respectively), the latter records VBP IV 83 Kol. I and II separately. Nevertheless, *Papyri.info* stores one single text (<http://papyri.info/ddbdp/p.bad;4;83>), merging both sets of metadata together. Conversely, P.Bagnall 70, a fragment of a register of official letters (three currently extant) likely issued by the joint *stratēgos* of the *merides* of Polemon and Themistos in the Arsinoites in May, AD 232, is recorded by TM as a single item (TM 219331), likely because everything was written by the same person. The same does APIS: of course, catalogues of collections are more interested in the text as material object, rather than on the content it bears (for collections catalogues see below, § 3.6). Nonetheless, HGV splits the papyrus in three sections corresponding to the three surviving text portions (ll. 1–9, 10–17, and 18–23), since they have three different dates; and three separated texts are encoded in *Papyri.info*. It is apparent how much the integrated databanks are able to overcome scientific uncertainties in defining and categorizing complex papyrological materials (in the following pages, the screenshots of the two cases discussed here).

[illegible]

Another problem lies in the traditional but rather artificial categorizations of text typologies. The big, canonical separation between documentary texts and literary texts has left a large twilight zone²⁰¹ – sometimes called ‘paraliterary’ (one may wonder why not ‘paradocumentary’), ‘subliterary’ (with an implicit,

out-of-place evaluation), or ‘semi-literary’ (again, (un)consciously pejorative?) – which is uneasily treated by those catalogues and databases that imposed themselves some sort of genre boundary:

[e]ppure l’apporto testuale e culturale di questa letteratura è prezioso e originale, in quanto ci è pervenuta solo grazie ai ritrovamenti egiziani che hanno salvato letteratura effimera o contingente, come opere di studio e di scuola (pensiamo ai dizionari), letteratura tecnica di tradizione fluida, dalla geografia alla medicina, all’astronomia, alla magia. Testo e lessico di queste opere altrimenti perdute, sebbene studiati nelle specializzazioni della disciplina, non sono mai stati ricompresi nei *Thesauri* e soffrono di un’assoluta non ricercabilità²⁰².

It is remarkable, for instance, that HGV does record some medical prescriptions (e.g. SB XXVI 16458, TM 64564), which are to be found in LDAB as well because considered ‘paraliterary’, but not other texts of the same type (e.g. O.Bodl. II 2183, TM 64502) that are recorded in LDAB only. Of course, this is not a primary shortcoming of digital platforms themselves, but is inherited from editorial tradition: typically, HGV includes all what has been republished in the *Sammelbuch*, so that the selection comes upstream. Look at the significant case of O.Bodl. II 2182, medical prescription, republished by Louise C. Youtie in 1977 and then flowed into *Sammelbuch* XIV as no. 11708 (TM 63912). It does appear both in HGV and LDAB. Nevertheless, O.Bodl. II 2183, of the very same type and immediately successive, re-edited by Claire Préaux in 1956, was not taken into consideration for SB, and thus was not included in HGV (TM 64502). Some special databases, like the mentioned *TM Magic*, or the *Catalogue of Paraliterary Papyri* and the *Digital Corpus of the Greek Medical Papyri* (see below, §§ 8.6–7 and 9), have been specifically conceived because of the difficult categorization of some text typologies. Nevertheless, it is apparent how an all-inclusive catalogue like *Trismegistos* is truly fundamental in overcoming any possible artificial displacement. Standardization and integration are more and more unavoidable for a complete mastery of a fragmentary and multifaceted discipline like Papyrology.

In both cases (definition of the ‘papyrological unit’ and categorization of texts), digital tools prove essential in founding universal and balanced standards. Thus, once more, it must be stressed that their role is not that of pure supports to traditional research: they contribute to a methodological and epistemological reconsideration of the whole discipline. They are an essential part of the current scholarship.

3.5 Extant, Would-Be, and Passed Away Digital Thematic Catalogues

Alongside the ‘general’ catalogues described above, one can find plenty of

thematic or special metadata databases around the Web, consecrated to many different topics of papyrological interest. Usually, such resources stem from specific research projects, or from the academic concerns of one or more scholars. We have already encountered all the special catalogues embedded into or appended to the *Trismegistos* platform (DAHT, HHP, ATE, *TM Archives*, *TM People*, *TM Places*, *TM Collections*, *TM Authors*, *TM Editors*), as well as some connected ones (BCD, APD, *Fayum Project*), but several more resources are available online. Some of them offer the full text of all or part of the documents recorded, but their general shape is that of the catalogue, focused on the context information.

The spread of the use of digital databanks to manage huge amounts of papyrological metadata for the sake of research projects, or specific investigations on the documentary or literary sources, or even the construction of proper *corpora* of texts, is apparent²⁰³. Few more than ten years separate, e.g., Giovanna Menci's description of the advantages of electronic cataloguing of tachygraphic papyri – a project soon abandoned for economic and technological shortage – from M.G. Lancellotti's planned computerized corpus of the magical gems, C.D. De Luca's announced electronic catalogue of Greek and Latin books from the Fayum, and Willy Clarysse's and Mario Paganini's accurate elaboration of onomastical information from a special databank²⁰⁴ – and these are just few examples of quasi-endless perspectives still open and available, in particular thanks to the powerful means of the *Trismegistos* network²⁰⁵. I myself had plenty of fruitful experience in easily managing high quantities of metadata with the help of *Microsoft Access* sheets during my collaboration to the *Synopsis* project at the Heidelberg Institute of Papyrology²⁰⁶. The ease of use of such software as *FileMaker Pro* or *Access* and the possibility to make information and research results available to everyone by publishing the database online are other important factors to be highlighted.

Juristic Papyrology, a particularly tough branch, requiring specific skills in ancient law and a deep knowledge of the relevant documents, takes great advantage of digital cataloguing tools. His own academic interests and his strong synoptic planning have led Uri Yiftach (now at Tel Aviv) to develop an invaluable tool cataloguing all the papyrological documents with a specific legal relevance: *Synallagma – Greek Contracts in Context* (formerly known as *Greek Law in Roman Times* = GLRT)²⁰⁷. The database, hosted on an *ArtlId* collection management platform²⁰⁸, collects metadata from Greek documents with legal relevance from the Ptolemaic, Roman, and Byzantine periods, with a particular focus on the historical and social development of law and legal practices. Originally focused on six types of documents – lease, sale, loan, marriage, labour contracts, and wills –, the databank has extended to include also other document typologies, such as divisions of family estates, petitions, applications, court proceedings. It offers a browsing list of text typologies

(lease contracts, acts of sale, credit-related transactions i.e. loans and deposits, testamentary dispositions, marriage contracts, laws and decrees, contracts of labour, *diairesis* i.e. divisions of joint property, debt settlements, petitions and applications, court proceedings, varia) and search functions in the cataloguing fields. After a basic contextualization (edition reference, links to HGV and *Papyri.info*, type of document, date, provenance, language) and some physical data (number of hands, letters per line, direction of writing, status, back), the indication of diplomatic category (i.e. the format or textual scheme, e.g. a letter-like *cheirophon*) introduces the more legally oriented features of each record. The more or less formulaic clauses that constitute the document are enumerated, and then a detailed account of the legal case is given: the parties involved (gender, age, name, patronymic, legal role, legal status, etc.), the objects involved (legal category, type of asset, value, etc.), the duration of the obligation, the remuneration (“consideration”). A side window offers a preview of the text, taken from the papyrological textual databank²⁰⁹ (see picture in the next page).

Artid

Logged in as **vlad_gri** | Change Password | Sign Out

Search | Edit | Compare

Req. Number BGU-01-02019

Link to External Databases

Contract BGU-01-02019

Date 15/5/186

Provenance Arsinoite

Language Greek

Physical Features

Number of Hands: 1 Letters in Line (From): 20 Letters in Line (To): 30 Direction of Writing: Condition: Back: Notes

Diplomatic Category Hypomnema

Classes

Address 2-5

Creation P-11

Lease -> Rent 11-15

Lease -> Tenant-related 15-16 (Spemmes)

Lease -> Taxes 16-18

Obligations 18-19

Rents 20-22

Lease -> See Hypomnema 22-23

Hypomnema 23-25

Date and Place 27-29

Preview Database Text

Link to Papyrological Navigator | xml file | Details | Berlin

bgu.1.39

AD 186 Arsinoite

Λογισμὸς Στεφανίου διὰ τὸν ὅρον -
Ἰσχυρὰς ἐστὶν καὶ κατὰ Νουμμοῦ(1) καὶ κατὰ

Parties

Gender	Age (From)	Age (To)	Name	Patronymic	Role	Legal Status/Status 1	Status 2: Also Mentioned	Notes
Female			Longina Demetria		Lesser	Enfranchised Group	-	Roman Citizen
Male			Tonname alias (Hypomnema)	Isidore	Agent			
Male			Isidore		Heretic			

Object

Legal Category	Type of Asset	M. Value (From)	M. Value (To)	Unit	Unit Spec.	Location	Provision of Delivery	Conditions upon delivery	Delivery Time	Add. Details
Kilima	Immovables -> Land -> Kilima	5,000								
Real Estate										

Duration

Year of	Month of	Day of	Year of	Month of	Day of	Duration	Duration	Year of	Month of	Day of	Notes

First | Prev | & of Items | Next | Last | Back

Marriage & Divorce Papyri of the Ancient Greek, Roman and Jewish World are collected also by D. Instone-Brewer (Tyndale House, Cambridge) in a web page (<http://www.tyndalearchive.com/Brewer/MarriagePapyri>) with the purpose “to study the background of the New Testament teaching on divorce and remarriage”. After an introduction to the subject and before a thematic bibliography, a list of links (sorted by language and date of the documents)

point to HTML tables, where the items are identified with very peculiar *sigla* (e.g., GM-267 stands for “Greek Marriage, 267 BC”). Metadata regard date, provenance, edition(s), reference to any English translation, link to on-site text (separated web pages, non-Unicode Greek encoding) and to the old version (*Perseus*: see below, § 8.3) of the *Duke Databank of Documentary Papyri*. A link to any existing online picture is given too (see picture in the next page).

The *Catalogue of Paraliterary Papyri* (CPP), compiled by Marc Huys and collaborators at K.U. Leuven as of 2003 (<http://cpp.arts.kuleuven.be>), is an expansion of the *Catalogue of Mythographic Papyri* (CMP), launched in 2001 by the same Huys and Thomas Schmidt. The latter aimed at collecting

information about all papyrus fragments with mythographic contents, even if such an element is only secondary (e.g. school texts with lists of names partially mythological), and it was quite essential in the information provided: it lacked, for example, a detailed comment on the texts²¹⁰. Its former link (<http://cmp.arts.kuleuven.be>) now redirects to CPP. CPP has been one of the first attempts to fill in the said gap between literary and documentary texts (see above, § 3.4) by providing also the full text (both in Beta Code and Unicode: see above and below, §§ 1.2, 8.3, and 8.6) of (some of) the papyri recorded. The ‘paraliterary’ texts collected by this *FileMaker* catalogue, seemingly not updated any more since 2007²¹¹, are mostly lists and catalogues, rhetorical treatises, grammatical papyri, commentaries on literary prose, school exercises, marginal annotations, citations related to literary works, mythographic texts – we will not find here, for example, typical ‘subliterary’ texts like scientific handbooks, according to a particularly restrictive interpretation of the ‘paraliterary’ typology²¹². The metadata are very detailed: apart from edition and inventory, a full reference to digital and paper catalogues (LDAB, TM, Pack, Van Haelst, Cribiore *Teachers and Students*, Van Rossum-Steenbeek *Greek Readers’ Digests*, Sutton *Homer and the Papyri*, Gigante *Catalogo dei papiri ercolanesi*) is given. Provenance, date, bibliography precede the full text. Then a literary section: author (original or quoted), genre, type (category), detailed contents, proper names mentioned, mythological characters mentioned. A bibliological and palaeographical section comes after, describing material, book form, size, script, sides, preservation state, column number, column width, and characters per line. To be stressed are a detailed comment on lectional signs and one on the scribe(s)’s hand. All fields, including full text, can be searched via drop-down menus or text string search, or one can browse through the records²¹³. CPP is regularly linked from TM when applicable (see above, § 3.3). A sample record is reproduced in the next page.

Positive Correlation

© 2005 Blackwell Publishing Ltd *Journal of Internal Medicine* 258: 103–110

Book	File	Image	Info	Links	Details
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[illegible]

Homer & the Papyri was originally created and edited by Dana S. Sutton (University of California, Irvine) on a couple of diskettes (*Homer and the Papyri 1.0*, Scholars Press, 1992)²¹⁴, and later it was published on the Web (2000). This website consisted of lists of published papyri and related items containing Homeric texts, along with a repertoire of the textual variants presented by this body of material, hypertextually linked to the lists of papyri. In 2001 the project was transferred to the Center for Hellenic Studies, with a view to its continuation and incorporation into the publications of the Center, including the multitext edition of Homer²¹⁵. A new edition of this catalogue (<http://www.stoa.org/homer/homer.pl>), now edited by Gregory Nagy, expands its utility: it is built on a fully searchable relational database (created by Michael Jones, with the cooperation and supervision of the Stoa Consortium, <http://www.stoa.org>). This database allows the users to search in one of six fields, such as title (*Iliad* or *Odyssey*), book number, and line number. There are also fields for variants, witnesses, and a more general description field, in which the users may search for special features (such as material, location, or editor). All features of the previous edition of *Homer & the Papyri* continue to be available in this second edition. For example, one can obtain a list of all *Iliad* papyri by simply choosing the title (“*Iliad*”) in the search form, and leaving the other options blank. Such a list may be further restricted by specifying a book number, or a range of books. Each field of the search form further specifies the search, and a list is then dynamically generated. Newly published Homeric papyri are added to the database, which is regularly updated²¹⁶.

Scholia minora in Homerum, on the *Aristarchus* portal (University of Genoa, <http://www.aristarchus.unige.net/Scholia/it-IT/Home>), edited by F. Montanari and D. Muratore, offers a list, with description, edition, and photographic reproduction, of the papyri containing glosses to Homeric words (Homeric glossaries). The catalogue, refurbished as of April 2017 (<http://www.aristarchus.unige.net/Scholia/it-IT/Database>; see picture below), is arranged by Homeric passage; the papyri are referred to with the edition or inventory number, followed by a short title of the content. The list can be filtered by collection or Homeric book. Each record contains the location of the fragment, a complete bibliography, a detailed description, and a link to a digital picture and to an edition of the text, in PDF format (when available). The editions are based on new revisions by the editors of the catalogue. A parallel resource has been offered by the late John Lendon, but his *Scholia Minora in Homerum: An Alphabetical List* is rather a word index and it will be presented in the appropriate section (§ 4.1)²¹⁷.



Nachtergaeel 2001 no. 36

Seal ID:	727
Publications:	Nachtergaeel 2001 no. 36
Inventory number:	32200
Photograph:	Nachtergaeel 2001 n. 246 (Pl. II, fig. 10)
Online photo:	
Description:	stamping object/seal matrix – Bois, L. 69,5 x l. 9,4 cm; ép. plaque 1,4; avec la poignée 6,8 cm. Sceau rectangulaire muni d'une poignée longitudinale ajourée, décorée de lignes incisées. Dans un cadre foré, inscription d'une ligne, de droite à gauche: "Hpwv Htrôleqaoui, Hérôn, fils de Ptolémaïos. Le nom et le patronyme du propriétaire sont courants à Evhéméria (pour ce qui est du nom, voir J. Bingen, "Le dieu Hérôn et les Hérôn du Fayoum", <i>Hommages à J. Lesclapart</i>, III = Bibliothèque d'Etude, 106/3, Le Caire, 1994, p. 49). Ils ne peuvent donner lieu à aucune identification. Ce sceau est probablement celui que Grenfell et Hunt ont exhumé à Evhéméria en 1898-1899 et envoyé avec d'autres objets au Musée de Gizeh. Là, il aurait été vendu dans une boutique du Musée où étaient étalées les pièces qui ne devaient pas être conservées; il est possible aussi qu'il y ait été débarrassé pour aboutir finalement sur le marché des antiquités. R. J. Nickels l'aurait acquis (le tiers des suggestions du Dr Jeffrey Spencer du Département of Egyptian Antiquities au British Museum; elles m'ont été obligeamment transmises par le Dr. Donald Bailey). Transcription en coproïotes: H.P. Grenfell, A.S. Hunt and D.G. Hogarth, <i>Koyûm, Towns and Their Papyri</i> (London, 1900), p. 46 (sans reproduction); cf. aussi British Museum, <i>A Guide to the Third and Fourth Egyptian Rooms</i> (London, 1904), p. 109, no. 283, 3; <i>A Guide to the Fourth, Fifth and Sixth Egyptian Rooms, and the Coptic Room</i> (London, 1922), p. 137 (référence communiquée par le Dr. Donald Bailey); R. Gavoli, <i>L'archeologia urbana nel Fayum di età ellenistica e romana – Missione congiunta delle università di Bologna e di Lecce in Egitto. Monografie</i>, I (Naples, 1998), p. 295 (simple mention).
Material (seal):	
Material (seal matrix):	Wood
Type of document sealed:	
Type of recipient sealed:	
Date:	Roman
Place:	Fayum: Evhemeria ?

Turning to purely 'documentary' Papyrology, the *Seals and Stamps* database, created by Katelijn Vandorpe and accessible via *Trismegistos* (<http://www.trismegistos.org/seals>; see picture above), provides detailed information on seals and stamps found on papyri and on other objects from Greco-Roman and Byzantine Egypt. It is divided into an extensive bibliography on the subject, a set of lists of occurrences, an overview article²¹⁹, and the proper database, where it is possible to search either for seals and stamping objects or for red stamps on papyrus. For each item are given its publication reference, collection, inventory, indication of picture, detailed description, material, type of document sealed, date and provenance (for red stamps, shape and issuing office); the fields are all searchable from the home mask. This database is linked from *TM Texts* records.

Start
Informationen
Literatur
Kontakt
>> Datenbank



Dime online

GERDA HENKEL STIFTUNG
Prosopographie zu Soknopaiu Nesos
nach den demotischen und griechischen Quellen

Griechische Belege

suchen
 durchsuchen
 >> anzeigen
 >> Datensätze

<<< << 4 / 397 >> >>>

Prosopographie **Vorname/Nachname** **Belege** **alle Belege**

Beleg-Informationen

ID: **Identifikator** **al. Nummer** >>

gr. **Person** **al. Nummer** >>

Übersetzung Beleg / Typ: **griech. Übersetzung / Typ:** **Metatext-Übersetzung / Typ:**

Verdachtsdatum: **Verdachtsname:** **Übersetzung:**

gr. al. Nr. **al. Nr.** **al. Nr.**

Zusatz: **Kolonnen rechts/versetzt in Überschrift:**

Altkl. / Vorgabe:

Biographisches:

Ausstellung, Flucht, Verhaftung: **Titel:**

Text:

erschienen in: **Herausgeber:** **Ort:** **Verlag:**

<< [0/0] >>

Nomenklatur:

<< [0/0] >>

demotische Belege

<<< << 11 / 3338 >> >>>

Prosopographie **Vorname/Nachname** **Belege** **Übersicht**

Beleg-Informationen

ID: **Identifikator** **al. Nummer** >>

dem. **Person** **al. Nummer** >>

Übersetzung Beleg / Typ: **griech. Übersetzung / Typ:**

Verdachtsdatum: **Verdachtsname:** **Übersetzung:**

gr. al. Nr. **al. Nr.** **al. Nr.**

Zusatz: **Kolonnen rechts/versetzt in Überschrift:**

Altkl. / Vorgabe:

Biographisches:

Ausstellung, Flucht, Verhaftung: **Titel:**

Text:

erschienen in: **Herausgeber:** **Ort:** **Verlag:**

<< [1/1] >>

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Death on the Nile

[PROJECT](#)[TEAM](#)[BIBLIOGRAPHY](#)[MLDATABASE](#)[LINKS](#)[LIBRARY](#)[EVENTS](#)

The project *Death on the Nile*, established in 2007 by Sofia Torallas Tovar (CSIC, Madrid) and François Gaudard (Oriental Institute, Chicago), has now extended to comprise all the aspects of death in Graeco Roman Egypt (<http://deathonthenile.upf.edu>; formerly <http://www.lineas.cchs.csic.es/death>), but was originally conceived to produce a database of Greek and Demotic mummy labels, which is still under completion (*Mummy Label Database*, <http://deathonthenile.upf.edu/database>). The records are stored with a huge set of metadata (publication and conservation information, TM number, date and provenance, detailed physical and material description, script information, commentary, bibliography) and provide also the full text, taken from *Papyri.info*, and its English translation. Any field, full text included, is searchable; a virtual keyboard allows for entering searching terms in Greek or Demotic. For now, ca. 300 Greek labels have been entered, and Demotic texts are expected soon. In addition, one can refer to a static PDF produced by Klaas A. Worp on the basis of TM data²²³, where mummy labels are listed by edition and provided with very basic metadata (TM number, publication, inventory); an alphabetic list of locations of collections possessing mummy labels is appended at the end. The PDF is downloadable from the project website.



Death on the Nile

Metadata database

Search by filters

Filter by:

Acquisition

Like:

SEARCH

Filter results by:

Column name: Institution

Like: Ägyptisches Museum

Or

Column name: Material

Like: Wood

If you prefer Greek/Demotic text search, use this keyboard

Greek/Demotic text:

α	β	γ	δ	ε	ς	η	θ	ι	κ	λ	μ	ν	ξ	ο	π	ρ	ς	τ
υ	φ	χ	ψ	ω	ι	ι	ι	ι	ι	ι	ι	ι	ι	ι	ι	ι	ι	ι
κ	λ	μ	ν	ξ	ο	π	ρ	ς	τ	υ	φ	χ	ψ	ω	ι	ι	ι	ι

Backspace | Enter | Submit

SEARCH

Chartae Latinae Antiquiores Online is a web page developed by the publishing house Urs Graf Verlag that allows searching a metadata database of the famous printed repertoire of the most ancient Latin documentary manuscripts (http://www.urs-graf-verlag.com/index.php?funktion=chla_suche). The search mask is made by drop-down menus and text string boxes, and the results are shown in a table listing material, document type, reference to ChLA edition, date, place of production, scribe, current location of the various items.



Agriculture in Graeco-Roman Egypt (AGRE, <http://www.agre.uni-tuebingen.de>)²²⁴, edited by Christian Leitz and Sandra Lippert (Tübingen), is a thematic database devoted to the history of agriculture and land use in ancient Egypt. Hundreds of Demotic documents related to the subject topics have been collected with basic metadata (identification, dating and provenance of the source), full text in transliteration (the appropriate font *Transliteration* is required to display the transcriptions), and English & German translation, and relevant information concerning e.g. agricultural products, specification and location of agricultural areas, tax or lease payments, prosopography, bibliography. The entry of Greek, Coptic, and Arabic texts was planned, but unfortunately the website currently seems not to work properly due to seeming technical issues.

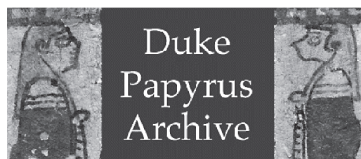
The quick perishability of digital resources is indeed a main issue. They are undoubtedly more volatile than printed paper, though paper has its own issues too. Such valuable resources as *Christian Papyri. A Supplement to van Haelst's Catalogue*, published by Cornelia Römer in 2003 as a bibliographical

update to Van Haelst's catalogue in the form of a hypertext page, has disappeared from the Web²²⁵. Digital tools have improved the preservation of cultural heritage very much, but the preservation of digital scholarly heritage should be taken care of too²²⁶. Fortunately, such repositories as the *Internet Archive* store 'screenshots' of past web pages (*WayBack Machine*: <https://archive.org/web>), though the work is not always really systematic, and does not consider offline material or software. Since more and more resources are produced as electronic only, the history of the discipline would take advantage very much from a global memory of its computerized past.

3.6 Digital Catalogues of Papyrological Collections

Very few introductory words are to be said on the importance of cataloguing a papyrological collection: knowing exactly which pieces can be found in a certain place, what they are like, and what they can contain, and making this information available to the whole papyrological community, is a fundamental step in the progress of a research that is ultimately based on scattered fragments. Even though not all the fragments preserved are transcribed and published, it is important to know what exists, in view of future studies, joins, discoveries²²⁷. The good practice of cataloguing papyrological collections is not new, but the rise of the digital technologies – as in other aspects of the discipline – have brought an invaluable advantage to the work of storing information about published and unpublished pieces, that is their metadata, and of making it accessible to the entire community²²⁸. They are therefore core projects not only for the single collections themselves, but also for the entire discipline, in the usual terms of sharing, accessibility, comparison, and eventually collaboration. To this respect, digital imaging is the natural *pendant* of digital cataloguing²²⁹, so that not only metadata are made available but also digital reproductions of the pieces themselves. Just for ease of discussion, I will deal with the progress in digital imaging further on (§ 5, part. 5.1).

The following inventory, collecting the existing online catalogues of papyrus collections worldwide, is perhaps not 100% complete, but at least helps sketching an overview that is comprehensive enough to trace some significant trends²³⁰. The pioneer of digital catalogues – as of other aspects of Digital Papyrology (see above and below, §§ 2.3 and 8.3) – has been the Duke Papyrus Collection, which started conserving, studying, cataloguing and imaging its largely unpublished papyri, with a grant of the National Endowment for the Humanities, as early as 1992²³¹.



Conceived by John Oates (co-founder of the *Checklist* and of the *Duke Databank of Documentary Papyri*) and called *Duke Papyrus Archive*,

[t]he project introduced some novel ideas about accessing information about papyri. The catalogue records would be presented in a standard format and become part of local and international databases, where they could be accessed by a wide variety of users, not just

professional papyrologists for whom the printed catalogue was intended. The standard format, derived from the second edition of the Anglo-American Cataloguing Rules, would make searches for certain subjects more predictable or at least less idiosyncratic. The databases would provide their own search engines, which would not require the use of special or system-dependent software on the part of the users. Since there was open access to the online catalogue of the Duke University Libraries, no user would need to acquire an expensive set of CD ROMs or another medium containing the records. By September, 1992, the need for a printed catalogue quickly evaporated. More and more papyrologists were becoming computer literate and they could also be expected to use the online databases to get at the information they wanted. In addition, experiments at The University of Michigan had shown that scanning papyri rather than photography was the way of the future²³².

As noticed above, the relationship between online cataloguing and imaging is strict:

[o]nly the Internet allows links between large sets of descriptive data and large sets of images. The Duke papyrus project could make a smooth transition to the Internet, because it had been producing just such a large set of descriptive data – the catalogue records describing the papyri – and was in the process of producing just such a large set of images. This is an essential point: the production of large sets of images for the Internet has to go hand in hand with the production of large sets of descriptive data. Without the catalogue records the images of the Duke papyri would not only be meaningless, but also inaccessible. Of course, one could call them up one by one and try to make sense of what one sees, but this would be impractical²³³.

The possibilities offered by the Internet were immediately and clearly understood, and since – as we saw – making such catalogues available is a priority not only for the single institutions but for the entire community as well, a larger project was launched soon after, with the innovative purpose of creating one single network of the catalogues of the major papyrus collections in the United States. This joint enterprise, planned in 1995, was named *Advanced Papyrological Information System* (APIS) and led by Oates together with Roger Bagnall (Columbia University)²³⁴ and Traianos Gagos (University of Michigan)²³⁵. Berkeley, Princeton, and Yale joined the effort soon after, and the project was launched in 1996/7 with the even wider goal of creating “a collections-based repository of information about and images of papyrological materials [...] located in collections around the world; it was envisaged as a first stage in creating a comprehensive papyrological working environment online”²³⁶. APIS has grown through the years, encompassing many American and non-American (e.g. Oslo, St. Petersburg, Lund, Gothenburg) papyrus collections²³⁷, and in 2013 it was merged into the *Papyri.info* platform, and systematically linked to the other resources hosted there, completely fulfilling the idea of access, collaboration, standardization, integration and universalism that Digital Papyrology is constantly pursuing²³⁸. Since the very beginnings, collaboration and standardization have been a major concern too: earlier participating institutions were required to send their metadata to Columbia following the common standards²³⁹, while now the

collaborative architecture of *Papyri.info* allows everyone to directly contribute the metadata to the system²⁴⁰, always following strict standards. An XML structure automatically generated from the metadata editor grants, as usual, full compatibility with other databases, thus also integration and universalism.



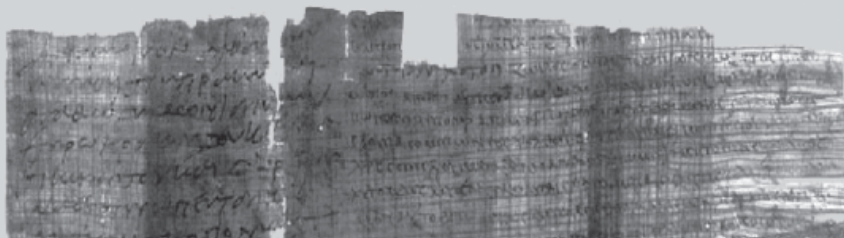
APIS Advanced Papyrological Information System

PLEASE NOTE

Advanced Papyrological Information System (APIS) content

is now available at:

papyri.info



Papyri.info

[sign in](#)

Browse: DDBDP HGV APIS TM Number or Search: Data Bibliography

apis

berenike
berkeley
britmus
chicago
columbia
duke
fordham

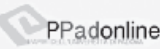
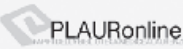
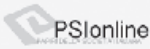
gothenburg
hermitage
leidenpapist
lund
michigan
morgan
nyu

oslo
oxford-ipap
perkins
petra
princeton
psr
pts

pullman
sacramento
stanford
toronto
trinitis
upenn
uts

wisconsin
yale

Bastianini, Lucio Del Corso and Rosario Pintaudi, which records not only Florentine material, from the Istituto Papirologico “Vitelli” and the Biblioteca Medicea Laurenziana, but also the Padua collection, and is expected to include also the Prague papyri²⁴¹, and of *Ductus*, which gathers all Spanish papyrus funds, under the direction of Alberto Nodar and Sofia Torallas Tovar²⁴².



[Home](#) [Ricerca](#) [Help](#) [Il Progetto](#) [Contatti](#) [Autorizzazioni e Diritti](#) [Privacy](#)

PSIonline - PLAUonline - PPadonline - PPRAGonline

Attraverso questo sito è possibile consultare i cataloghi informatici del **PSI – Papiri della Società Italiana** e del **P. Laur. – Papiri della Biblioteca Medicea Laurenziana**.

Il progetto è il frutto di accordi di cooperazione stipulati tra diverse istituzioni italiane e straniere: la Università di Bologna, Cassino, Messina, Napoli e Padova, l'Accademia Fiorentina di Papirologia, l'Istituto Papirologico Vitelli – Università di Firenze, la Biblioteca Medicea Laurenziana, il Museo Egizio del Cairo. La sua realizzazione è attualmente curata dal Centro Editoriale e dal Laboratorio di Scienze Storiche e Archeologiche dell'Università (Dipartimento di Scienze Umane, Speciali nella Storia) dell'Università di Cassino.

Per esplorare il contenuto del database ed effettuare ricerche partire da qui: [Ricerca](#)

Per avere informazioni riguardanti i copyright delle immagini dei papiri consultati e la sezione [Autorizzazioni e Diritti](#)

UNIVERSITÀ DELL'STUDIO DI CASSINO - BIBLIOTECA LAURENZIANA - ACCADEMIA FIORENTINA DI PAPIROLOGIA - ISTITUTO VITELLI - MUSEUM OF EGYPTIAN ANTIQUITIES

DVCTVS

National Papyrological Funds

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DVCTVS News!

Welcome to DVCTVS, the papyrological portal in our country. Here you will find information about our papyrological funds in the form of a digital catalogue. You will also find the digital images and texts of those papyri that have already been published. DVCTVS is an ongoing project, so we would appreciate your comments and contributions, both in terms of the operation of our database and new papyrological material that you think fits into our portal.



Signing by four institutions:
CSIC, Compagnia de Jesús a Catalunya, Arzobis de Meubisrat, Universitat Pompeu Fabra.



Roll: Collection Palau-Ribes.



Papyri in Scriptorium Biblicum. Abadia de Montserrat.





Egyptian Drawing on thread.
Collection Palau-Ribes.

DVCTVS







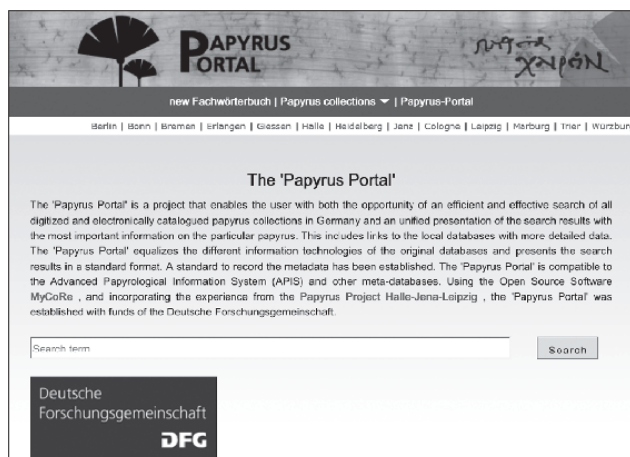

[Help: about Digital Catalog](#)
[Contact](#)

Although such efforts effectively contribute to the fight against fragmentation of the papyri, scattered and dispersed among numerous collections worldwide, fragmentation of the catalogues is still the rule – most of them use their own standards, their own selection of metadata, their own software. Nevertheless,

[g]li archivi elettronici per le discipline umanistiche, già punto di riferimento obbligato per gli studiosi, sono destinati a diventare una sorta di ‘genere editoriale’ a sé stante, che dovrà sviluppare sempre meglio regole, standard, formati condivisi²⁴³.

APIS has been pathbreaking in dealing with the issue of standards, initially adopting SGML²⁴⁴ and then moving to XML. A significant, positive, further step towards this direction has been recently made by the German *Papyrus Portal*, a project led by Reinhold Scholl and aimed at connecting all catalogues of German papyrus collections in one single search engine. Its goal is to give the opportunity of both an efficient and effective search and a unified, homogeneous, standard presentation of the search results with the most important information on each item, and links to the full original data in the local catalogues²⁴⁵. The *Portal*, funded by the Deutsche Forschungsgemeinschaft, uses the open-source database software *MyCoRe*²⁴⁶, is compatible with APIS and other similar metadata catalogues, and stems from the experience of the *Papyrus Projekt Halle-Jena-Leipzig*, already directed to the integration of some German papyrus collections in a single

platform²⁴⁷. Many collections accessible via the *Portal* had already joined in the various branches of the so-called *Papyrus Projekt* (Bremen, Erlangen, Giessen, Halle, Jena, Köln, Leipzig, Marburg, Würzburg)²⁴⁸, some hold independent catalogues (Berlin, Bonn, Heidelberg, Trier), and therefore the outcome is impressive. Of course, due to the original differences, the search is to be made in all fields, and there is no way to further narrow the results.



The screenshot shows the homepage of the Papyrus Portal. At the top, there is a header with a logo on the left consisting of a stylized fan and the text "PAPYRUS ORTAL". To the right of the logo is a navigation bar with links: "new Fachwörterbuch | Papyrus collections" and "Papyrus-Portal". Below this is a horizontal menu listing various locations: "Berlin | Bonn | Bremen | erlangen | Giessen | Halle | Heidelberg | Jena | Cologne | Leipzig | Marburg | Trier | Würzburg". The main content area has a title "The 'Papyrus Portal'" followed by a paragraph describing the project. Below the text is a search bar with the placeholder "Search term:" and a "Search" button. At the bottom left, there is a logo for the "Deutsche Forschungsgemeinschaft" and the "DFG" logo.

PAPYRUS ORTAL

new Fachwörterbuch | Papyrus collections | Papyrus-Portal

Berlin | Bonn | Bremen | erlangen | Giessen | Halle | Heidelberg | Jena | Cologne | Leipzig | Marburg | Trier | Würzburg

The 'Papyrus Portal'

The 'Papyrus Portal' is a project that enables the user with both the opportunity of an efficient and effective search of all digitized and electronically catalogued papyrus collections in Germany and an unified presentation of the search results with the most important information on the particular papyrus. This includes links to the local databases with more detailed data. The 'Papyrus Portal' equalizes the different information technologies of the original databases and presents the search results in a standard format. A standard to record the metadata has been established. The 'Papyrus Portal' is compatible to the Advanced Papyrological Information System (APIS) and other meta-databases. Using the Open Source Software MyCoRe , and incorporating the experience from the Papyrus Project Halle-Jena-Leipzig , the 'Papyrus Portal' was established with funds of the Deutsche Forschungsgemeinschaft.

Search term:

Search

Deutsche Forschungsgemeinschaft
DFG

compatible, but will this compatibility be implemented into effective integration? The integration of APIS in *Papyri.info* proves invaluablely helpful, as the cataloguing metadata are displayed alongside the other information, and since a long time the former has ceased to be a purely North-American resource. More and more collection catalogues are implementing various sorts of links to the appropriate records in the textual databank and/or in general catalogues like TM, HGV, LDAB, M-P³ (see details below), and sometimes integrate the text itself in their fields (this is the remarkable, but not the only, case with the Berlin catalogue). An interesting implementation comes from the newish version of the online catalogue of the Kölner Papyrussammlung (see below): permanent URLs based on the TM unique numerical identifiers (see above, § 3.3) allow for an easy embedding of the catalogue records directly in HGV²⁵⁰. The dream of a global and, in a sense, “democratized”²⁵¹ papyrological network – almost indispensable in an increasingly “globalized world of learning”²⁵² – appears closer and closer every day that goes by²⁵³.

Collection: Aberystwyth, National Library of Wales

Name: The Oxyrhynchus Papyri

<https://www.llgc.org.uk/en/discover/digital-gallery/manuscripts/the-early-ages/the-oxyrhynchuspapyri>. The section is dedicated to the only three papyrus fragments preserved at the National Library of Wales (= P.Oxy. XII 1521, 1572, 1590), with a picture of them. The catalogue record is at <https://archives.library.wales/index.php/papyri-from-oxyrhynchus>.

Search options: none; **Metadata:** Inventory, provenance, date, location, title; **Images:** Yes

Collection: Allentown (PA), Muhlenberg College

Name: Muhlenberg College: Robert C. Horn Papyri Collection

<http://www.sscommons.org/openlibrary/#3|collections|7730556|Muhlenberg20College3A20Robert20C2E20Horn20Papyri20Collection||>. The collection, not part of APIS, can be browsed from this page or searched for from the more general search mask of the *Shared Shelf Commons* platform (“Advanced Search”).

Search options: (internal engine), hypertext navigation; **Metadata:** Title, publication, date, size, description (with palaeography and content), inventory, location, language; **Images:** Yes

Collection: Basel, Bremen, Erlangen, Köln, Marburg, Würzburg

Name: Papyrus Projekt

<https://papyri-collection.dl.uni-leipzig.de>. A joint catalogue belonging to the *Papyrus Projekt* (see above).

Search options: internal engine, hypertext navigation; **Metadata:** Inventory, title, acquisition info, publication info, material, colour, size, preservation status, completeness, format, description, text type, language, script, content, provenance, date, ink colour, line number, writing direction, side; **Images:** Yes

Collection: Berenike *ostraka* (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Berkeley (see also: Berkeley, Chicago, Columbia, *et al.*)

Name: APIS Berkeley Database

<http://www.lib.berkeley.edu/libraries/bancroft-library/tebtunis-papyri/berkeley-apis-search-form>. Though part of the APIS system (see above), the Center for the Tebtunis Papyri still maintains its local version, where it is possible to perform either simple (<http://>

www.lib.berkeley.edu/libraries/bancroft-library/tebtunis-papyri) or advanced searches among the papyri kept at the Bancroft Library of the University of California, Berkeley, and regional partners.

Search options: internal engine; **Metadata:** APIS ID, inventory, location, text type / title, side, connections, material, size, lines, physical description, palaeography, publication status, date, provenance, language, genre, content, publications, bibliography / corrections; **Images:** Yes

Collection: Berkeley, Chicago, Columbia, Duke, Fordham, Gothenburg, St. Petersburg (Hermitage), Leiden, Lund, Michigan, Morgan, New York (University and Union Theological Seminar), Oslo, Cairo (Oxford / IPAP), Perkins, Helsinki (Petra papyri), Princeton, Pullman, Sacramento, Stanford, Toronto, Pennsylvania, Wisconsin, Yale, Berenike *ostraka*, Trimithis *ostraka*

Name: Advanced Papyrological Information System (APIS)

<http://papyri.info/browse/apis>. On the collective catalogue APIS see above. It is fully integrated into the *Papyri.info* platform (see below, § 8.4): the browsing page, arranged by institution, leads to the search results in the *Papyrological Navigator*. Full search into its metadata is also provided via the PN masks.

Search options: internal engine, hypertext navigation; **Metadata:** APIS number, inventory, title, publication, material, size, description, provenance, acquisition, language, date; **Further information:** notes; **Images:** Yes, when available

Collection: Berlin

Name: Berliner Papyrusdatenbank (= BerlPap)

<http://ww2.smb.museum/berlpap>. Ongoing catalogue of the Berliner Papyrussammlung, belonging to a big project funded by the Deutsche Forschungsgemeinschaft. It is provided with side information (introduction to papyrology, bibliographical references, the Berlin collection), with a search engine for the fields ("Erweiterte Suche"), and with the possibility of browsing the records by publication volumes (BGU, BKT, other Berlin editions, as well as different editions containing papyri from Berlin) and numbers.

Search options: internal engine, hypertext navigation; **Metadata:** Inventory, title, material, acquisition, provenance, format, location, description, side, writing direction, language, text type, date, links to other catalogues (TM, HGV) and to *Papyri.info*; **Further information:** detailed description of the content; full bibliography; text from *Papyri.info*; **Images:** Yes

Collection: Bologna

Name: Papyri Bononienses

<http://amshistorica.unibo.it/papiribon#>. Browsing catalogue arranged by publication number. It provides only the digital pictures, but the inventory number, a short description of the content and the date are recorded by hand on labels placed on the glass frames and visible in the photos.

Search options: hypertext navigation; **Metadata:** none; **Images:** Yes

Collection: Bonn

Name: Bonner Papyrus-sammlung

<http://131.220.91.160/fmi/iwp/cgi?-db=Papyrus&-loadframes>. This catalogue currently seems not to work properly; for the search options it refers to the *Papyrus Portal* (see above).

Search options: internal engine; **Metadata, further information:?**; **Images:?**

Collection: Bremen (see also: Basel, Bremen, Erlangen, *et al.*)

Name: Bremer Papyri

<http://brema.suub.uni-bremen.de/papyri>. Independent catalogue of the Bremen papyri,

which are also available through the *Papyrus Projekt* (see above). Both searchable and browsable.

Search options: internal engine, hypertext navigation; **Metadata:** Inventory, title, provenance, date, material, size, language, collection; **Further information:** short description of the content and of the discovery; **Images:** Yes

Collection: British collections

Name: Gazetteer of Papyri in British Collections (GPBC)

<http://gpbc.csad.ox.ac.uk>. The catalogue was intended to record source, content and location of papyrus collections in libraries, museums, universities and private ownership in Britain, describing holdings, provenance, circumstances of acquisition and archival elements (cf. VAN BEEK 2007, 1042). Unfortunately, it is temporarily suspended.

Collection: Cairo (see also: Berkeley, Chicago, Columbia, *et al.*)

Name: Photographic Archive of Papyri in the Cairo Museum

<http://ipap.csad.ox.ac.uk>. This catalogue stems from the AIP/UNESCO International Photographic Mission that in the 70s and 80s made slides and photographs of the 6000 published Greek papyri held in the Cairo Museum, constituting the International Photographic Archive of Papyri (IPAP: see below, § 5). These photos have been catalogued and digitized by the Centre for the Study of Ancient Documents at Oxford (CSAD, <http://www.csad.ox.ac.uk>), drawn partly from B/W negatives taken by Adam Bülow-Jacobsen, partly from colour slides and B/W negatives held in the Papyrology Room at Oxford. The catalogue is arranged by publication numbers (plus a section of “Apocripha et Pseudepigrapha” = P.Cairo 10759 codex) and can be browsed with the help of a drop-down menu.

Search options: hypertext navigation; **Metadata:** Publication, size, title, date, *Papyri.info* link, HGV link; **Further information:** description of content; **Images:** Yes

Collection: Chicago (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Copenhagen

Name: The Papyrus Carlsberg Collection

<http://pcarlsberg.ku.dk>. This is an inventory of all published Carlsberg papyri, completed by a bibliography and a concordance of joins with fragments in other collections. There is a browsing list arranged by script (Arabic, Coptic, Demotic, Greek, Hieratic, Hieroglyphic, Latin, Miscellaneous) and then by inventory number, and another full list by inventory number only.

Search options: hypertext navigation; **Metadata:** Inventory, publication, title / content, joins; **Images:** No

Collection: Copenhagen

Name: The Papyrus-Collection at The Department of Greek and Latin, SAXO Institute (P.Haun.) <http://www.igl.ku.dk/bulow/PHaun.html>. A page created by Adam Bülow-Jacobsen, which describes the papyri kept at the Department of Greek and Latin of the Saxo Institute, with links to available pictures.

Search options: hypertext navigation; **Metadata:** inventory numbers, publication; **Images:** Yes, when available

Collection: Dallas, SMU, Bridwell Library, Perkins School of Theology (see also: Berkeley, Chicago, Columbia, *et al.*)

Name: Papyri at Bridwell Library

<https://sites.smu.edu/bridwell/specialcollections/bridwellpapyri/brpapyri.htm>. This institution participates in APIS (see above). Here, the papyri are listed by inventory number; a different page (“Transcriptions/Translations”) gives a scan of the edition of the

papyrus and its translation. “Contents” opens two browsing lists, arranged by inventory number and by date.

Search options: hypertext navigation; **Metadata:** Inventory, title, language, provenance, date, physical description (with material and size), conservation status, palaeography, acquisition, bibliography; **Images:** Yes

Collection: Dublin, Chester Beatty

Name: Center for the Study of New Testament Manuscripts

<http://www.csntm.com/Manuscript>. The Chester Beatty papyri are catalogued together with other manuscripts, but there are several options for narrowing the search results. The descriptions of the documents can be downloaded in PDF format.

Search options: internal engine, hypertext navigation; **Metadata:** Rahlfs number, material, date, location, content, physical description; **Images:** Yes

Collection: Durham (NC), Duke University (see also: Berkeley, Chicago, Columbia, *et al.*)

Name: Duke Papyrus Archive (DPA)

<http://library.duke.edu/rubenstein/scriptorium/papyrus>. Though part of the APIS system (see above), the Duke papyrus collection still maintains its pioneering page, where the papyri can be browsed by selected topics (Archives; Cultural aspects; Forms of documents; Geographical names – with a map; Material aspects; No text – pictures only; Religious aspects; Script; Slaves; Women and children) or by language (Hieratic, Demotic, Coptic, Greek, Latin, Arabic). Topics and languages are commented. A *Google Search* applet is implemented. For description of the project and technical details see VAN MINNEN 1995.

Search options: (internal engine), hypertext navigation; **Metadata:** Inventory, title, subject (keywords and topics), material, physical description, size, publications; **Further information:** comments; **Images:** Yes

Collection: Erlangen (see: Basel, Bremen, Erlangen, *et al.*)

Collection: Florence (BML)

Name: Papiri letterari della Biblioteca Laurenziana

<http://www.accademiafiorentina.it/paplett>. This catalogue, edited by the Accademia Fiorentina di Papirologia, partially overlaps *PSI Online* (see above and below) but is focused on the literary papyri kept at the Biblioteca Medicea Laurenziana in Florence, with a strong interest in palaeography and bibliography. The resource, stemming from a CD-ROM application (cf. CAPASSO 2005, 231–2; CRISCI 2007), offers a full search mask in all fields (“Ricerca”) and a browsing facility by categories (“Categorie”: date, provenance, material, format, literary genre).

Search options: internal engine, hypertext navigation; **Metadata:** Publication, title, material, language, genre, provenance, date, format, side, size, physical details, bibliography, catalogue references; **Further information:** detailed physical description, bibliographical reconstruction, commentary (mainly palaeographical); **Images:** Yes

Collection: Florence (Istituto Vitelli & BML), Padua

Name: PSOnline / PLAURonline / PPadonline

<http://www.psi-online.it>. A joint catalogue of the Florentine (Istituto Papirologico “Vitelli” and Biblioteca Medicea Laurenziana) and Padua collections for indexing the papyri published in the PSI, P.Laur., P.Flor., and P.Pad. series (P.Prag. and Florentine papyri published in different series are announced as forthcoming). On goals and technical details of the project, cf. DEL CORSO 2007; see also above.

Search options: internal engine; **Metadata:** Publication number, text type, location, provenance, material, format, side, date, size, content, *Papyri.info* link, TM link, LDAB link; **Further information:** notes (also on acquisition and bibliography); **Images:** Yes

Collection: Genève

Name: Papyrus de la bibliothèque de Genève

<http://www.ville-ge.ch/musinfo/bd/bge/papyrus>. It is possible to perform simple (all fields) or advanced searches; the results can be saved and exported in PDF.

Search options: internal engine; **Metadata:** Inventory, size, publication, BL, title, content, opistograph, side, fibres, material, palaeography, date, provenance, genre, language, acquisition, LDAB; **Further information:** notes; **Images:** Yes

Collection: Giessen

Name: Giessener Papyri- und Ostrakatenbank

<http://digibib.ub.uni-giessen.de/cgi-bin/populo/pap.pl>. Earlier catalogue of the Giessen collection, later flowed into the *Papyrus Projekt* (see above). Both searchable and browsable according to the catalogue fields. On the Giessener Papyrussammlungen see <http://www.unigiessen.de/ub/ueber-uns/sam/papyri-ostraka-keilschrifttafeln> and on the digital cataloguing project (with technical details) cf. DREYLING – KALOK 2001; see also LANDEFESTER 2003, *passim*.

Search options: internal engine, hypertext navigation; **Metadata:** Title, inventory, publication, material, size, side, provenance, acquisition info, bibliography, language, date; **Further information:** annotations; **Images:** Yes

Collection: Giessen

Name: Papyrus Projekt

<https://papyri-giessen.dl.uni-leipzig.de>. See above.

Search options: internal engine, hypertext navigation; **Metadata:** Inventory, title, acquisition info, publication info, material, colour, size, preservation status, completeness, format, description, text type, language, script, content, provenance, date, ink colour, line number, writing direction, side; **Images:** Yes

Collection: Glasgow

Name: Greek Papyrus Fragments from Oxyrhynchus in Glasgow University Library's Special Collections Department (MS Gen 1026)

<http://special.lib.gla.ac.uk/teach/papyrus/oxyrhynchus.html>.

Search options: none; **Metadata:** Inventory, date, content, publication reference; **Images:** Yes

Collection: Gothenburg (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Graz

Name: Papyri

http://sosa2.uni-graz.at/sosa/katalog/index_papyri.php. The Graz papyri are indexed by inventory number and can be browsed via a drop-down menu.

Search options: hypertext navigation; **Metadata:** Inventory, material, format, size, date, provenance, publication, title / content; **Images:** Yes

Collection: Groningen

Name: Digital Collections: Papyri

<http://facsimile.ub.rug.nl/cdm/landingpage/collection/papyri>. This catalogue displays a list of all the papyri; this can be narrowed through a menu arranged by title, document type, date, and TM number. There are also a simple and an advanced search tools.

Search options: internal engine, hypertext navigation; **Metadata:** Publication, inventory, title, content, date, size, notes (BL), provenance, literature, *Papyri.info* link, TM number; **Images:** Yes

Collection: Halle, Jena, Leipzig

Name: Papyrus und Ostraka Projekt

<http://papyri.uni-leipzig.de>. A joint catalogue belonging to the *Papyrus Projekt* (see above). The search functions (“Retrieval”) are very articulated, and divided by “General”, “Written object” (material information), “Text” (content information), “Documents” (with reference to the documents catalogued: texts or 3D objects). Each field is searchable, with various possible combinations and a powerful chronological search tool. A browsing section (“Index”) is also available. Each record has a static URL, an XML structure, which can be displayed, and can be printed (i.e. exported) in PDF format. For further details on the project see HAMMERSTAEDT – SCHOLL 2007 and BLASCHEK – QUENOUILLE 2016.

Search options: internal engine, hypertext navigation; **Metadata:** Inventory, title, acquisition info, publication info, material, colour, size, preservation status, completeness, format, description, text type, language, script, content, provenance, date, ink colour, line number, writing direction, side; **Images:** Yes

Collection: Harvard

Name: Digital Papyri at Houghton Library

<http://hcl.harvard.edu/libraries/houghton/collections/papyrus>. This institution does not participate in APIS. From this page, a list of the papyri, listed by inventory number, is available for browsing; searches can be performed from the *Hollis* platform of the Harvard Library (<http://hollis.harvard.edu>).

Search options: internal engine, hypertext navigation; **Metadata:** Inventory, title, physical description, size, language, notes (with language and publication), genre, format, bibliography (link); **Images:** Yes

Collection: Heidelberg

Name: Griechische Papyri der Heidelberger Papyrussammlung

A basic catalogue (http://www.rzuser.uni-heidelberg.de/~gv0/Papyri/P.Heid._Uebersicht.html) allows browsing the collection by publication numbers; a more detailed and recent one (<http://zaw-papy.zaw.uni-heidelberg.de/fmi/xml/Griechisch/home.xml>) allows both searching in the fields and browsing by inventory number. Similar catalogues also for Demotic (http://www.rzuser.uni-heidelberg.de/%7Egv0/Papyri/P.Heid.Dem._Uebersicht.html & <http://zaw-papy.zaw.uni-heidelberg.de/fmi/xml/Demotisch/home.xml>), Coptic (http://www.rzuser.uni-heidelberg.de/~gv0/Papyri/P.Heid.Kopt._Uebersicht.html & <http://zaw-papy.zaw.uni-heidelberg.de/fmi/xml/Koptisch/home.xml>), and Arabic papyri (<http://zaw-papy.zaw.uni-heidelberg.de/fmi/xml/Arabisch/home.xml>).

Search options: internal engine, hypertext navigation; **Metadata:** Inventory, title, material, size, provenance, date, text type, language, content (keywords), publication status and references, reference to other catalogues (Pack2, LDAB) if applicable, BL reference if applicable; **Further information:** bibliography, annotations; **Images:** Yes

Collection: Heidelberg, Sammlung Gradenwitz

Name: Papyri aus der Sammlung Gradenwitz

<http://www.rzuser.uni-heidelberg.de/~gv0/Papyri/Grad.html>. The page offers a list of pictures, under the inventory numbers, and of scans from the 1935 catalogue redacted by Frieda Gossmann (cf. HAGEDORN – WÖRPER 2001). It is probably the only catalogue obtained by means of scanning a paper source.

Search options: hypertext navigation; **Metadata:** Inventory, title, date, size; **Further information:** short history of the collection; **Images:** Yes

Collection: Helsinki (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Jena (see: Halle, Jena, Leipzig)

Collection: Köln (see also: Basel, Bremen, Erlangen, *et al.*)

Name: Kölner Papyrus-Sammlung

<https://papyri.uni-koeln.de>. Independent catalogue (new version released in April 2017) of the Köln papyri, which are also available through the *Papyrus Projekt* (see above). The previous version of this catalogue (<http://www.uni-koeln.de/phil-fak/ifa/NRWakademie/papyrologie>) only allowed for browsing the published papyri arranged by papyrus editions, whether in the *Papyrologica Coloniensia* series or in the proper *Kölner Papyri* (P.Köln). Each record has a permanent link based on the TM number (see above).

Search options: internal engine; **Metadata:** Inventory, title, TM number, object type, material, text description, bibliography, text typology, dating, provenance, HGV/DDB number, language, script, direction of writing, ink colour, hand description, publication, symbols keywords; **Images:** Yes

Collection: Lecce

Name: Museo Papirologico – La Collezione

http://www.museopapirologico.eu/mus_coll.htm#. This is not a catalogue, but just a description of the collection. It is said that there exists a digital picture of each object, but they are not available online.

Search options: none; **Metadata, further information:** none; **Images:** No

Collection: Leiden (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Leipzig (see: Halle, Jena, Leipzig)

Collection: London, British Library

Name: British Library Collections

There is no specific catalogue for the British Library papyri. An introductory page (<https://www.bl.uk/collection-guides/papyri#>) points to the main library catalogue (<http://searcharchives.bl.uk>) and informs that a small number of papyri has been digitized and can be viewed on <https://www.bl.uk/manuscripts>. The *ostraka* have their own introductory page (<https://www.bl.uk/collection-guides/ostraca>) but are not yet included in the online catalogue. On some issues about the British Library papyrus collection cf. VAN MINNEN 2007, 708.

Search options: internal engine, hypertext navigation; **Metadata:** Inventory, size, short description; **Images:** Yes, when available

Collection: London, UCL (Hawara papyri)

Name: The Hawara Papyri (P.Hawara)

<http://www.ucl.ac.uk/GrandLatMisc/hawara>. The papyri can be browsed by SB number, P.Haw. inventory number, date, and content. The Hawara papyri preserved elsewhere (e.g. Yale) are linked to the appropriate institution. The links to the text point to the old *Duke Databank of Documentary Papyri*.

Search options: hypertext navigation; **Metadata:** Section/side, material, size, lines, mounting status, conservation status, palaeographic description, publication status, date, provenance, language, text type, title, publication, editor; **Further information:** Bibliography, link to text; **Images:** Yes, when available

Collection: Lund (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Madison, University of Wisconsin (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Madrid, Montserrat, Palau-Ribes, Fundación Pastor

Name: Ductus

<http://dvctvs.upf.edu/collections>. A collective catalogue of Spanish papyrus collections. It

is interesting to note that beside cataloguing and digital imaging, the platform offers the digital text of the published documents, with a search function for it (see above and below, § 8.6).

Search options: internal engine; **Metadata:** Inventory, publication, title, editor, location, side, associated texts, provenance, period, date, author, ancient work, text type, language, genre, subject, citations, alphabet, illustrations, attestations, medieval transmission, format, material, *kollesis*, size, columns, line length, line number, line spacing, letter height, margins, surface, fibres, features, idiosyncratic traits, bilinearity, marginal annotations, corrections, punctuation, scribe, findspot, date of finding, conservation state, bibliography, link to other resources; **Images:** Yes

Collection: Manchester (Rylands papyri)

Name: Rylands Papyri Collection

<http://luna.manchester.ac.uk/luna/servlet/ManchesterDev~93~3>. From the home page it is possible to browse all the documents (“Browse All”) and then refine the search by certain categories (content, place, personal name, date), or to browse by those categories (“Category Pages”). From the results page it is also possible to select and perform an “Advanced Search”. The collection itself is presented at <http://www.library.manchester.ac.uk/about/support-us/jrri/priority-collections/papyrus-collection>.

Search options: internal engine, hypertext navigation; **Metadata:** Inventory reference, side, image title, date, size, material; **Further information:** Bibliography, legal and technical information on the image; **Images:** Yes

Collection: Marburg (see Basel, Bremen, Erlangen, *et al.*)

Collection: Michigan (see also: Berkeley, Chicago, Columbia, *et al.*)

Name: Advanced Papyrological Information System, UM (APIS UM)

<http://quod.lib.umich.edu/a/apis>. Though part of the APIS system (see above), the University of Michigan Papyrus Collection (<https://www.lib.umich.edu/papyrology-collection>) still maintains its local version. Here it is possible to browse sample records, to see the newest additions and updates, to browse by topics (alphabetically ordered), and to perform either simple (all the fields) or advanced (specific fields) searches.

Search options: internal engine, hypertext navigation; **Metadata:** Inventory, side, material, size, lines, conservation status, publication status, location, date, provenance, language, genre, text type / title, content, persons, Perseus link, publication info; **Further information:** translation; **Images:** Yes

Collection: Montserrat (see: Madrid, Montserrat, Palau-Ribes, Fundación Pastor)

Collection: Morgan State University, Baltimore MD (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Munich

Name: Bayerische Staatsbibliothek – Sammlungen: Papyri

<https://www.bsb-muenchen.de/sammlungen/altertum/bestaende/papyri>. A survey of the papyri, with their inventory number and some photos. Few information also at <https://www.bsb-muenchen.de/sammlungen/handschriften/epochen/antike/#c2797>.

Search options: none; **Metadata, further information:** none; **Images:** Yes, when available

Collection: Naples (Herculaneum papyri)

Name: Chartes

<http://www.chartes.it>. It is the online development of a former CD-ROM catalogue (*Catalogo Multimediale dei Papiri Ercolanesi*), based on an Access database, published in

2005 by the Centro Internazionale per lo Studio dei Papiri Ercolanensi “Marcello Gigante” (CISPE) and edited by Gianluca Del Mastro (cf. LEONE 2009, 223; LONGO AURICCHIO 2010, 445). Searches can be performed for the main catalogue fields (<http://www.chartes.it/index.php?r=document/search>) and also for “pieces”, i.e. for size ranges (<http://www.chartes.it/index.php?r=piece/search>). A separate search engine for the photos is available at <http://www.chartes.it/index.php?r=image/index>.

Search options: internal engine; **Metadata:** Subject, author, language, conservation status, size; **Further information:** Notes, bibliography, links to other resources (e.g. LDAB); **Images:** Yes, when available

Collection: New York, Columbia University (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: New York, Fordham University (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: New York, NYU (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: New York, Union Theological Seminar (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Oslo (see also: Berkeley, Chicago, Columbia, *et al.*)

Name: Oslo Papyri Electronic System (OPES)

<http://ub-fmsserver.uio.no>. The catalogue is divided into a browsing table (“Record List”), which can be arranged according to each of the columns (Title or type, Genre, Date, Publication or Inventory ID, Origin i.e. geographical origin), and a mask (“Find”), which allows searching for a selection of fields (Type of text, Inventory number, Origin i.e. provenance, Person, Subject / Keyword, Geographic). The Oslo papyri are catalogued via APIS too (see above).

Search options: internal engine, hypertext navigation; **Metadata:** Inventory, material, connections, size, lines, side, palaeography, date, origin, provenance, acquisition, language, genre, author, text type, title, content, subject keywords, persons, geographica, translation, Papyri.info link, publication, editor, SB, corrections, republication, bibliography; **Images:** Yes

Collection: Oxford

Name: Pinax (The Imaging Papyri Project)

<http://163.1.169.40/cgi-bin/library>. Indexed catalogue of the papyri of the Oxford collections, namely the Oxyrhynchus papyri (*Oxyrhynchus Online*), the Antinoupolis Papyri (*P.Ant.*), the facsimiles of the Herculeum papyri preserved at the Bodleian Library (*P.Herc.*), and the *Supplementum Magicum* (*Suppl.Mag.*). It is possible to search in any of the catalogue fields (but no combined search is allowed) or to browse each collection by authors, titles, genres, dates, or publication numbers (hypertext structure). Another portal allows entering the *Oxyrhynchus Online* project (<http://www.papyrology.ox.ac.uk/POxy>), with many more links and special features (highlights on particular papyri, developments of imaging technologies, etc.). There is a separate Location List (<http://www.papyrology.ox.ac.uk/POxy/lists/lists.html>) telling where the Oxford papyri (not only from Oxyrhynchus) are physically preserved. A list of published photos (<http://www.papyrology.ox.ac.uk/POxy/lists/photolist.html>) may prove also useful. An apparently earlier table of contents of the P.Oxy. volumes is still available at <http://www.csad.ox.ac.uk/POxy/papyri/tocframe.htm>. As to the Herculeum papyri, a list of them and of their editions is available at <http://www.herculeum.ox.ac.uk/?q=editions>. P.Herc. 118 is preserved at the Bodleian Library and its picture is available here: <http://image.ox.ac.uk/show?collection=bodleian&manuscript=msgrclassb1p112>.

Search options: internal engine, hypertext navigation; **Metadata:** Title, editor, publication date, author, date, provenance, location, genre (content), format, material; **Images:** Yes, but only those owned by Oxford

Collection: Padua (see: Florence, Padua)

Collection: Palau-Ribes (see: Madrid, Montserrat, Palau-Ribes, Fundación Pastor)

Collection: Paris: Sorbonne & P.Euphrate

Name: Institut de Papyrologie: Les Collections de Papyrus

<http://www.papyrologie.paris-sorbonne.fr/menu1/collections.htm>. A static catalogue (still in progress) of the papyrus collections of the Institute of Papyrology of the Sorbonne, plus the private collection of P.Euphrate (see below, § 3.7). The former are divided by language (Demotic, Greek, Latin, Coptic, Arabic) and then by publication (series, then number – P.Bour., P.Enteux., P.Count, P.Lille, P.Rein., P.Sorb., SB, and various other editions) or by textual genre (literary/subliterary and documentary). Literary papyri can be browsed by inventory number, author, adespota, M-P³ number, Van Haelst number. The documentary papyri comprise records not indexed anywhere else in the catalogue (basically, several *Sammelbuch* pieces). Special sections are devoted to illustrated papyri and virtual reconstructions (see below, § 5.3).

Search options: hypertext navigation; **Metadata:** Inventory, content, size, publication;

Images: Yes

Collection: Parma

Name: Materiali papirologici al Museo Archeologico di Parma

<http://www.papirologia.unipr.it/parma>. Alongside three hieroglyphic papyri and a hieratic one, the Archaeological Museum holds two *ostraka*: a Coptic and a Greek (illegible) one. The online catalogue, published thanks to the kind permission of the keeper of the Egyptian collection, Dr. Roberta Conversi, reproduces the entries of Giuseppe Botti's printed catalogue (BOTTI 1964).

Search options: hypertext navigation; **Metadata:** Inventory, edition; **Further information:** Translation, commentary, bibliography; **Images:** Yes (low resolution)

Collection: Philadelphia (see also: Berkeley, Chicago, Columbia, *et al.*)

Name: Papyri and Related Materials at the University of Pennsylvania

<http://ccat.sas.upenn.edu/rak/ppenn.html>. The University of Pennsylvania papyrus collections flowed into APIS but their old catalogues (1998–2009) are still available, including Kraft's catalogue of eBay-sold papyri (see below, § 6.5).

Search options: hypertext navigation; **Metadata:** Inventory; **Further information:** physical description, palaeographical description; Betacode transcription (only for the Penn Library Collection); **Images:** Yes (when available)

Collection: Princeton (see also: Berkeley, Chicago, Columbia, *et al.*)

Name: Princeton Papyri Collections

<http://pudl.princeton.edu/collections/papyri>. Though part of the APIS system (see above), the Princeton Papyri Collections maintain a local catalogue where it is possible to browse the records in the given order, or to perform simple searches. The records refer to the Princeton University Library Papyrus Home Page, at <http://www.princeton.edu/papyrus>, for a Descriptive Inventory, but the access seems to be forbidden.

Search options: internal engine, hypertext navigation; **Metadata:** Inventory, lines, size, publication, bibliography, physical description, location; **Images:** Yes

Collection: Provo (UT), Brigham Young University

Name: Didymus Papyrus

<https://lib.byu.edu/collections/didymus-papyrus>.

Search options: hypertext navigation; **Metadata:** Title, author, date, physical description, size, subject, genre, publications, language, provenance, acquisition; **Images:** Yes

Collection: Pullman (WA), Washington State University (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Sacramento (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Schøyen Collection

Name: The Schøyen Collection: Papyri & Ostraca

<http://www.schoyencollection.com/special-collections-introduction/papyri-ostraca>. The browsing catalogue can be searched by script (Hieroglyphic, Hieratic, Demotic, Greek, Coptic, Syriac), or via a simple search field.

Search options: internal engine, hypertext navigation; **Metadata:** Inventory, title, content, physical description, acquisition, publication, provenance, dates, related documents; **Further information:** commentary; **Images:** Yes

Collection: St. Petersburg, Hermitage (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Stanford University (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Toronto (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Trier

Name: Trierer Papyrussammlung

<http://digipap.uni-trier.de>. The page points to a PDF listing all published Trier papyri, arranged by inventory number, and to the proper catalogue (build with *FileMaker Pro*). This is automatically displayed as a browsing list arranged by inventory number ("Übersicht"), but it is possible to perform searches ("Suche") for content, place, and/or language.

Search options: internal engine, hypertext navigation; **Metadata:** Inventory, title, material, text type, side, size, provenance, date, language, content (keywords), publication info, catalogues (LDAB, Pack²) and corrections (BL), bibliography, publication status; **Further information:** Annotations; link to *Duke Databank* (old site); **Images:** Yes

Collection: Trimithis *ostraka* (see: Berkeley, Chicago, Columbia, *et al.*)

Collection: Utah, J. Willard Marriott Library

Name: Arabic Papyrus, Parchment, and Paper

https://collections.lib.utah.edu/search?facet_setname_s=uum_app.

Search options: hypertext navigation; **Metadata:** Title, subject, description (with physical and palaeographical details), date, type, digitization specifications, inventory, provenance, language, name of cataloguer; **Images:** Yes

Collection: Vienna

Name: Papyrussammlung

<https://www.onb.ac.at/bibliothek/sammlungen/papyri>. The catalogue (at http://aleph.onb.ac.at/F?func=file&file_name=login&local_base=ONB08) is part of the website of the Austrian National Library. It is possible a simple search in the fields or an advanced search for the combination of queries, while a browsing utility allows selecting the preferred order.

Search options: internal engine, (hypertext navigation); **Metadata:** Text type, inventory, publication status, title, provenance, date, size, language, material, side, content, links (LDAB, TM), bibliography, LDAB number, TM number; **Further information:** annotations; **Images:** Yes, when available

Collection: Warsaw

Name: Papyri in the Department of Papyrology

<http://www.papyrology.uw.edu.pl/papyri.htm>. The collection (presented at the parent home page) can be browsed (via drop-down menus) by inventory number or by edition. On the digital cataloguing project see WIPSYCKA – DERDA – MARKIEWICZ – URBANIK 2000.

Search options: hypertext navigation; **Metadata:** Inventory, edition; **Images:** Yes

Collection: Würzburg (see: Basel, Bremen, Erlangen, *et al.*)

Collection: Yale (New Haven, CT) (see also: Berkeley, Chicago, Columbia, *et al.*)

Name: Papyrus Collection Database

<http://beinecke.library.yale.edu/collections/highlights/papyrus-collection-database>.

Though part of the APIS system (see above), the papyrus collection of the Beinecke Library at Yale maintains its own catalogue (the cataloguing criteria are explained at <http://beinecke.library.yale.edu/research/library-catalogs-databases/guide-yale-papyrus-collection> in details). The page refers to the catalogue at <http://beinecke.library.yale.edu/papyrus>, then redirects at <http://brbl-legacy.library.yale.edu/papyrus>; I am temporarily unable to access it (so to March 9, 2017).

3.7 Envisaging Virtual Corpora of Papyri

The legacy of digital papyrological catalogues goes far beyond diffuse access to metadata. As Traianos Gagos put it,

[o]n the pragmatic/practical level the electronic media offer several opportunities for research development which cannot be achieved easily through traditional means. For instance, now for the first time we can put together in ‘virtual reality’ archives and collections of papers that have long been scattered in papyrological collections around the globe²⁵⁴.

This idea(l) of a virtual collection of documents is quite diffused. “With APIS we face the advent of a worldwide virtual papyrus collection and what I believe will be a true transformation of scholarly work”²⁵⁵, Roger Bagnall warned at the very beginning of the process, envisaging – as already pinpointed several times – an active role of the digital practices in the development of new forms of scholarship. Lucio Del Corso, more recently, spoke of “uno spazio virtuale in cui riprodurre le funzioni di una vera e propria biblioteca ideale”²⁵⁶, referring to the *PSIonline* platform. There is an underlying concept that the digital *avatar* of the papyrus, as either/both picture or/and set of metadata, or even electronic text, is not a mere instrument to reach the original piece and the original information, but an object itself of study and research, and of autonomous collection. It is a challenging perspective, which we will encounter again apropos of digital imaging (see below, §§ 5.5 and 9).

Nevertheless, it is worth mentioning the possibility of exploiting this ‘virtual reality’ to constitute dossiers, archives, *corpora* of papyri. This does not relate to virtual restoration and to the chance of joining together fragments of the same papyrus preserved in different locations (see below, § 5.3), but to

a case like that of the P.Euphrate collected in 2015 by Jean Gascoü beside the digital catalogue of the Sorbonne papyri (<http://www.papyrologie.paris-sorbonne.fr/menu1/collections/pgrec/peuphrategeneral.htm>; see above, § 3.6).

Les documents grecs et syriaques d'époque romaine du Moyen Euphrate [...] ont déjà suscité une abondante littérature scientifique. Toutefois, comme les éditions, qui se sont échelonnées de 1990 à 2000, se dispersent entre plusieurs revues, dont certaines sont peu familières aux romanistes, leur utilisation méthodique n'allait pas sans difficultés. C'est pourquoi nous avons voulu les réunir dans un catalogue muni d'un index²⁵⁷.

In other words, we are speaking of the possibility of creating 'virtual' *corpora*, dossiers of homogeneous documents dispersed in the academic and in the real worlds. The online collection of P.Euphrate comprises digital pictures ("Leur affichage en ligne est un prélude à la réunion de l'ensemble du dossier dans un catalogue unique"²⁵⁸), scholarly publications, bibliography, and word indices by categories resembling the traditional indices of papyrus editions or *corpora*, so much that the website is officially referred to by the *Checklist*.

Another example could be *La banque des images des papyrus de l'Aphrodite byzantine* (BIPAB) created by Jean-Luc Fournet in 2000 at http://www.misha.fr/papyrus_bipab. In relying almost exclusively on the photographic side of the thing, it is indeed something different from the special or thematic catalogues described above.

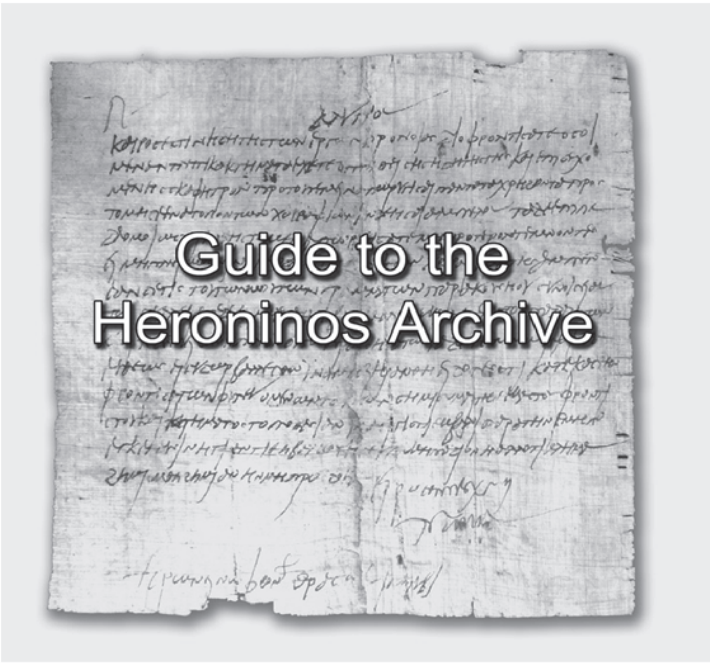
[C]'est la première banque d'images 'horizontale', se donnant pour objet, non une collection de documents hétéroclites, mais un ensemble cohérent dispersé entre plusieurs collections. Elle tente de regrouper toutes les images des papyrus grecs et coptes du village d'Aphrodité connus sous le nom d'"archives de Dioscore d'Aphrodité" (VI^e siècle après J.-C.), auxquels ont été adjoints, étant donné leurs recoupements prosopographiques avec celles-ci, les papyrus de même provenance trouvés dans les années 1940 — soit un total de quelque 650 papyrus qui en font un des trois plus gros ensembles archivistiques du 'millénaire papyrologique' et le plus important d'époque byzantine.

The goal is therefore to create a virtual archive, or dossier, of documents otherwise dispersed among different collections and places (a list on the left of the page allows browsing them alphabetically by edition)²⁵⁹:

le nombre des papyrus relevant de ces archives atteint aujourd'hui un seuil critique (environ 650) qui rend le dossier difficilement maîtrisable sans une tentative de regroupement sur un support informatique. La BIPAB, qui n'est qu'un instrument dans un dispositif plus vaste [...], permet ainsi de réunir pour la première fois virtuellement la totalité de ces archives éclatées.

The announcement relates to an electronic guide of the archives of Dioscorus of Aphroditō, to be developed with more information about the papyri (description, text, bibliography), as well as a topographical and a prosopographical databases.

A similar resource has been very recently released for another group of papyri: an *Electronic Guide to the Heroninos Archive*, developed by Dominic Rathbone, Rosario Pinaudi, Antonio López García, and Pierpaolo Borghesi, which was announced by Pinaudi and Rathbone at the 23rd International Congress of Papyrology (Wien 2011²⁶⁰) and finally published in May 2017 on the website of the Accademia Fiorentina di Papirologia at http://www.accademiafiorentina.it/?pg=sp_hero. This *FileMaker* database collects all the published texts belonging or related to the archive of Heroninos, categorized in several groups; of each record, the metadata considered are: publication and inventory information; material (including recto/verso indication); size; reference to pictures; text typology; prosopography (authors and addressees); internal date; modern dating; bibliography; BL corrections; notes. Each field is searchable via the web interface (“Search form” in the top menu), by itself or in combination with other ones. The texts can also be browsed by year, publication series, material, hosting institution, personal name, text group, text typology, scholars’ names, through the links provided in the top menu²⁶¹.



Guide to the Heroninos Archive

A peculiar sort of virtual collection, to conclude, is *Demotic Texts Published on the World Wide Web*²⁶², a project by the Research Archives of the Chicago Oriental Institute aimed at indexing all Demotic papyri that have been made available online, especially as images. The documents are arranged by text category and identified with inventory numbers; each item is linked to the original source. The page is equipped with final sections devoted to Demotic resources online, websites of collections, institutions, and projects, and various bibliographies.

BGU I 4

¹ An Severus Iustus, den *centurio*,
² von Aurelius Abus, dem V... leistete, Herr,
in Pêlusion, gab ich einem ge... meraden und
Freund, Gegenstände im We...
Aufbewahrung. ⁹ Ich wurde i...
ihm wegen dieser Dinge eine...
Entlassung, machte er mir keine Notrechnung. Ichmit ersuche ich, wobei
ich als Zeugen Syriôn, Sohn des Is[j]dôros, aus K[aran]is habe , der (mir)
zustimmte, darum, [daß sie Dir vorgeführt werden -- --]

A lemma in the

experimental HGV glossary tool.

Università degli Studi di Genova

PAWAG
Poorly attested words in ancient greek
directed by Franco Montanari

Loescher

Menu principale

- Home Page [A]
- Database [F]
- Forms [C]
- Hap [D]
- SQL [I]
- Pathways [F]
- Ammoniac [G]
- E.Mal. [S]
- Ammoniac [T]
- Ammoniac [H]
- Ammoniac [U]
- Ammoniac [J]

Database

Lemma in database: 1010
Ultimo aggiornamento: 2014-01-14

Get Firefox

Cerca nel database

Resultato della ricerca

Per cercare tutti i termini che in questo database

208 lemmi hanno dato il valore di ricerca
(qualche di esse sono)

Ammoniac [A]
Dove: [A] non presente, dove [A] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [B]
Dove: [B] non presente, dove [B] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [C]
Dove: [C] non presente, dove [C] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [D]
Dove: [D] non presente, dove [D] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [E]
Dove: [E] non presente, dove [E] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [F]
Dove: [F] non presente, dove [F] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [G]
Dove: [G] non presente, dove [G] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [H]
Dove: [H] non presente, dove [H] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [I]
Dove: [I] non presente, dove [I] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [J]
Dove: [J] non presente, dove [J] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [K]
Dove: [K] non presente, dove [K] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [L]
Dove: [L] non presente, dove [L] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [M]
Dove: [M] non presente, dove [M] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [N]
Dove: [N] non presente, dove [N] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [O]
Dove: [O] non presente, dove [O] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [P]
Dove: [P] non presente, dove [P] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [Q]
Dove: [Q] non presente, dove [Q] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [R]
Dove: [R] non presente, dove [R] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [S]
Dove: [S] non presente, dove [S] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [T]
Dove: [T] non presente, dove [T] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [U]
Dove: [U] non presente, dove [U] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [V]
Dove: [V] non presente, dove [V] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [W]
Dove: [W] non presente, dove [W] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [X]
Dove: [X] non presente, dove [X] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [Y]
Dove: [Y] non presente, dove [Y] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Ammoniac [Z]
Dove: [Z] non presente, dove [Z] presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ
Non presente in LSJ - non presente in LSJ

Above: the former PAWAG without *SPlonic* font installed; below: the new WiP.

AELIUS GALLUS
ROMAIN ORDRE EQUESTRE PREFET COMMANDEMENT MILITAIRE EXPEDITION
VICTORIEUSE ARABIE 025 A.C. - 024 A.C.
DION CASSIUS HIST ROM 053 029 002 CF STRABON GEOGR 002 012 118 017 053
819 PLINIE HIST NAT 006 028 160
RECEPTION DU CORPS AUXILIAIRE ENVOYE PAR HERODE ARABIE MER ROUGE
000-024 A.C. FLAVIUS JOSEPH ANT 015 012 003
COMPOSITION ANTIDOTE AU COURS CAMPAGNE MILITAIRE ARABIE 000-024 A.C.
CLAUDIUS GALENUS ANTIDOTES 002 014 180 02 017 203
VOYAGE D INSPECTION EGYPT THEBAIDE SYENE MONT D ETHIOPIE AVANT
000-024 A.C. STRABON GEOGR 002 012 118 017 028 806

Model of prosopographical

punch card (previous page)

and numerical encoding of prosopographical metadata (above; both from TOMSIN



1966).

The BL CD-ROM (from the BL website).

4Indexing Words

“When I use a word”, Humpty Dumpty said in rather a scornful tone, “it means just what I choose it to mean — neither more nor less”. “The question is”, said Alice, “whether you can make words mean so many different things”. “The question is”, said Humpty Dumpty, “which is to be master — that’s all”.

Lewis Carroll, *Through the Looking Glass*

Word indexes are more or less based on the same concept as catalogues: providing a collection of general or thematic referrals to certain papyri. However, in this case, the object of the collecting work is not context information (i.e. metadata), but the texts themselves. Indeed, automated indexing has been the primary push for the development of textual databases (see *infra*, § 8.2)²⁶³. Papyrus word lists generally collect words or phrases belonging to papyrus texts, giving the reference(s) of the occurrence(s), and sometimes providing a more or less detailed context (linguistic, historical, cultural...) as a comment to the word(s). Since a long time lists of words bear a cognitive function²⁶⁴: we filter the world through language, and we need to decode language to understand the world. More practically, indexes are also important keys to comparison with published texts, to find out parallels or just the correct completion of a fragmentary word.

Lexical lists can be as simple as concordances (just the words and the reference to their occurrences), or assume the format of a dictionary (with short definitions) or of a lexicon (sometimes with longer commentaries), whether general or thematic. Papyrology has a well-established tradition of linguistic tools, because of the well-known peculiarities of the Greek language of the papyri²⁶⁵: concordances like Daris’ *Spoglio lessicale papirologico*, general dictionaries like Preisigke’s *Wörterbuch*, thematic lexica like Preisigke’s *Fachwörter*, prosopographical dictionaries like the *Prosopographia Ptolemaica*, topographical dictionaries like Calderini-Daris’ *Dizionario dei nomi geografici*²⁶⁶ are essential instruments in the

papyrological research library. Textual databanks and metadata catalogues have gradually dissolved the concept of linear word indexes: the interconnected information that creates what Traianos Gagos called a meta-text²⁶⁷, intertwined to one another by means of interactive relational databases, modulates a ‘tabular’ universe²⁶⁸ where the words are extracted dynamically and exists only in virtual lists like the results of a query²⁶⁹. Certainly, this is quicker and easier, and even more up to date, than leafing through hundreds of pages; nevertheless, word indexes maintain a certain usefulness, since they allow throwing overall glimpses on certain subjects. Therefore, word lists are not completely absent from the digital scenario²⁷⁰.

4.1 Wörterlisten

The *WörterListen* (WL) *par excellence* are those compiled by Dieter Hagedorn. They have been released regularly from the servers of the University of Heidelberg since 2001 (<http://www.zaw.uni-heidelberg.de/hps/pap/WL/WL.html>) as a PDF file containing six alphabetical lists of words (months and days; personal names; geographical names; gods, sacred names and festivals; general word index; Latin words) collated from the word indexes of the more recent volumes of papyrological editions and relevant periodicals. Such lists can be browsed via the document structure view of *Acrobat Reader* (or of any other PDF reader); each word is simply followed by the list of occurrences in volumes and journals²⁷¹, abbreviated as explained in the first pages of the PDF.

According to the editor’s words, “die WörterListen erheben keinen Anspruch auf Wissenschaftlichkeit, sondern sollen nur ein schlichtes Hilfsmittel bei der täglichen Arbeit sein” (p. 12); and it is indeed a great *Hilfsmittel*, since it records new occurrences (and sometimes new words!) that have not yet been recorded by other databases, and therefore digitally unavailable. WL is thus a manually collected tool that integrates automatic word queries. It may look like a sort of role reversal, but we shall recall once more the great utility of electronic resources in managing constant updates of big quantities of information. Let us just guess the problems of issuing regular paper updates of such a resource, amounting to 583 pages!

WL is currently at its 20th version (June 1, 2016; 1st version: February 2001: see picture below), and as of April 2017 it has been completely renewed in an HTML version hosted in Köln (<https://papyri.uni-koeln.de/papyri-woerterlisten>, see picture in the next page). The basic structure is the same as the PDF version, but the alternate alphabetic and category indices are fully browsable and interconnected. Each record is based on an XML source and the publication references point to a bibliographical list connected with the *Papyri.info* bibliography. An internal search engine is implemented with different options (the “Rückläufige Suche” recalls the *KonträrIndex*, see

WL

A

B

Γ

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E

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H

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Λ

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Φ

Χ

Ψ

Ω

Suche...

☐ in Betaform (nicht anfordern)

Alphabet und Ziffer

Alphabetnummern

Geographie

Ältere Handschriften

Alphabetnummern

Werkzeuge und Links

Αα	Ββ	Γγ	Δδ	Εε	Ζζ	Ηη	Θθ	Κκ	Λλ	Μμ	Νν	Ξξ	Οο	Ππ	Ρρ	Σσ	Ττ	Υυ	Φφ	Χχ	Ψψ	Ωω	
7	28	89	15	14	4	3	49	77	39	123	175	229	8	216	436	90	56	85	41	16	3	2	1

Αα

Lemma

Stellen

Αα

Ββ

Γγ

Δδ

Εε

Ζζ

Ηη

Θθ

Κκ

Λλ

Μμ

Νν

Ξξ

Οο

Ππ

Ρρ

Σσ

Ττ

Υυ

Φφ

Χχ

Ψψ

Ωω

Αα

Ββ

Γγ

Δδ

Εε

Ζζ

Ηη

Θθ

Κκ

Λλ

Μμ

Νν

Ξξ

Οο

Ππ

Ρρ

Σσ

Ττ

Υυ

Φφ

Χχ

Ψψ

Ωω

Αα	Αα	77	123
Ββ	Ββ	77	123
Γγ	Γγ	77	123
Δδ	Δδ	77	123
Εε	Εε	77	123
Ζζ	Ζζ	77	123
Ηη	Ηη	77	123
Θθ	Θθ	77	123
Κκ	Κκ	77	123
Λλ	Λλ	77	123
Μμ	Μμ	77	123
Νν	Νν	77	123
Ξξ	Ξξ	77	123
Οο	Οο	77	123
Ππ	Ππ	77	123
Ρρ	Ρρ	77	123
Σσ	Σσ	77	123
Ττ	Ττ	77	123
Υυ	Υυ	77	123
Φφ	Φφ	77	123
Χχ	Χχ	77	123
Ψψ	Ψψ	77	123
Ωω	Ωω	77	123

order, i.e. from the last letter to the first one. The principle is the same as the *Rückläufiges Wörterbuch der griechischen Sprache*²⁷² and of course is very helpful to recognize fragmentary words lacking the beginning, which is quite often the case in the papyri. KI does not provide references to the occurrences of words: one should refer back to WL. As already noted, a “Rückläufige Suche” option is now appended to the new HTML WL version.

Personennamen	A	Ομήβια
Geographie	Βιθύλαα	Ζωβία
Algemeines Wörterverzeichnis	Πασα	Εύλογία
	Ψεντιβαβα	Εύστοργία
	Τάβα	Γεωργία
	Εγεβα	Υγία
	Ατίδα	Εύχυργία
	Δίδα	Δία
	Σεκοίνδα	Λευκοδία
	Οδία	Παλαιοδία
	Λοροβία	Παλλαιοδία
	Έριεα	Αβδία
	Ήρακλεια	Ροδία
	Πεττα	Κλαυδία
	Γαγίσα	Κλοδία
	Καγίσα	Ευσέβεια
	Δίσα	Ταδία
	Βαστίσα	Ειδάνθεια
	Κοσπία	Θάδεια
	Κοσπία	Ήρακλεια
	Βαθσοββαβα	Θηρακλεια
	Καβα	Σενηράδεια
	Ταββία	Ροκοδία
	Μάρβα	Άγαθόδεια
	Ταμίσθια	Λιουδία
	Άια	Φανόδεια
	Βαία	Άριστόδεια
	Εοβα	Παυλεια

An online word list referred to a single publication is the index of the *New Papyri from the New York University Collection*, usually referred to as P.NYU II but in fact edited by Bruce E. Nielsen and Klaas A. Worp in four instalments on the *Zeitschrift für Papyrologie* from 2000 to 2004 (see the *Checklist* for references). To keep trace of the whole set of papyri published, a separated PDF file of word indices, shaped as the usual word indices to papyrological volumes, has been made available from the WL folder²⁷³.

A thematic word list is *Scholia Minora in Homerum: An Alphabetical List*, compiled by the late John Lundon with the purpose of providing a comprehensive reference tool for retrieving Homeric glosses (i.e. explanations of Homeric words) and related material in the papyri²⁷⁴. The list collects the Homeric words alphabetically, with reference to the appropriate papyrus (edition/inventory and TM number with link to TM), reference to the Homeric passage involved, and transcription of the comment on the papyrus. Version 1.0 of this list appeared as a downloadable PDF in 2004 on the website of the Leiden University; versions 2.0 (2008) and 2.1 (2010) on that of the Köln University. In 2012 a third version was published in the “Trismegistos Online Publications” series (TOP 7²⁷⁵); this is numbered 1.0 again as it represents, in the author’s own words, “a fresh start” – as we saw, it is strictly connected with, and linked to, the TM records (see picture below). A different resource dealing with the same topic is the catalogue *Scholia Minora in Homerum via Aristarchus*, which has already been presented above (§ 3.5).

A

ἀάπτουε P.Köln inv. 2281 = TM 60390, 5.16 ad II. 1.567

ααπτουε: ἀπροσπέλαστουε

ἄβλητος P.Aphrod.Lit. II = TM 61011 F= 7 ↓ c, 1 ad II. 4.540

αβ[λητος

ἄβλητηρήν P.Mich. inv. 2720 = TM 61077 Fol. 6 verso, 24 ad II. 5.337

αβλητηρήν· αε[θενή, α]παλη(ν)

ἄγαλμα P.Lond.Lit. 30 + P.Sijp. 3^{me} = TM 60262, ad Od. 3.438

οτι αγαλμα το ιερειον Αμ()

ἀγάννυρον P.Bingen 8 = TM 66739 B, 2.29–30 ad II. 1.420

αγαννυρον· αγαν χνιζομενον

ἀγάννυρον P.Oxy. XLV 3238 = TM 60894 fr. 1, 1.7–8 ad II. 1.420

αγαννυρον· αγανιφετωδη, χειμερινον

4.2 General Dictionaries / Glossaries

A dictionary is more detailed than a concordance or a simple word list, in that it provides a summary contextualization of the word: typically, some etymological and grammatical notes, modern translations, some sample occurrences. Online interactive versions of famous Greek dictionaries like Liddell-Scott-Jones' *Greek-English Lexicon* (LSJ) or the *Diccionario Griego-Español* (DGE) are well known²⁷⁶, and only cursorily mentioned here since they are not proper papyrological resources, though being of the utmost help for papyrologists too: many occurrences from the papyri are also included.

The standard reference 'papyrological' dictionary, Preisigke's *Wörterbuch der griechischen Papyrusurkunden*, has not yet an electronic version²⁷⁷, while the colleagues Demoticists and Coptologists are luckier: the new *Chicago Demotic Dictionary* (CDD) edited by Janet Johnson has been published completely online²⁷⁸ as a supplement and update to Erichsen's 1954 *Demotisches Glossar*; and not only Crum's 1939 *Coptic Dictionary* is available online in a scanned version enhanced with a hypertext menu for browsing letters and apparatuses (<http://www.tyndalearchive.com/TABS/crum>), but a lexicographical database titled *Coptic Dictionary Online* has been developed by the Georgetown University (<https://corpling.uis.georgetown.edu/coptic-dictionary>). This is searchable by Coptic word, dialect, part of speech, English/French/German definition through a search mask. Since 2005, Demotic Papyrologists have at their disposal also a *Demotische Wortliste* (DWL) *online*, edited by Friedhelm Hoffmann (München) at <http://www.dwl.aegyptologie.lmu.de>²⁷⁹: a platform which allows searching for full or part of transliterated words, determinatives, and translations, in a databank that offers also a bibliography of works citing each

word. The possibility of searching for determinatives is a striking innovation, and very helpful in case of fragmentary words, as illustrated by Hoffmann himself in a 1996 *Vortrag*²⁸⁰.

4.3 Thematic Dictionaries / Glossaries (Lexica)

Select glossaries are more manageable than bigger dictionaries, from the viewpoint of the mere quantity of data, and this may explain why their electronic presence is a bit more widespread.

LMPG en línea (<http://dge.cchs.csic.es/lmpg>) is an open-access electronic version (in TEI XML) of the *Léxico de magia y religión en los papiros mágicos griegos*, compiled by Luis Muñoz Delgado as Annex V of the *Diccionario Griego-Español* (2001)²⁸¹. The lexicon aims at compiling and studying all terms related to magic and religion as attested in the Greek magical papyri, basically those edited by Preisendanz (PGM) and Daniel & Maltomini (Suppl.Mag.). The interest is double: a deeper study of magical and religious practices and a contribution to the knowledge of late Hellenistic Greek language (several *addenda lexicis* are recorded). On the home page we read:

En su contribución al volumen *The Oxford Handbook of Papyrology* [= VAN MINNEN 2009], titulada “The Future of Papyrology”, Peter van Minnen señala (p. 652), junto a la presencia del corpus de Preisendanz en el *Thesaurus Linguae Graecae*, la existencia de este léxico, si bien lamenta que, en su versión impresa, no resulte tan útil como una “fully searchable database”. Esperamos que *LMPG* en línea constituya un avance significativo en esta dirección para los estudios papirológicos y sobre la magia y la religión griega en general.

The screenshot shows a web browser displaying the 'LMPG en línea' website. The page is titled 'Diccionario Griego-Español' and 'LMPG en línea'. It features a search bar and navigation links. The main content area displays the entry for the Greek word 'ἀβάσκαντος, -ον'. The entry includes a list of related words on the left and a detailed description on the right. The description includes the following text:

1. que no produce manifestación
* de circunspección

2. libre de ensalzamiento, de magia

* de cosas

ἀβάσκαντος ἵππος ὁμοῦς ὕμνησε
ἵπ. que no produce manifestación, dentro asido: libro de magia. > XIII BC2

ἀβάσκαντος ἵππος ὁμοῦς ὕμνησε
ἵπ. que no produce manifestación, dentro asido: libro de magia. > XIII BC2

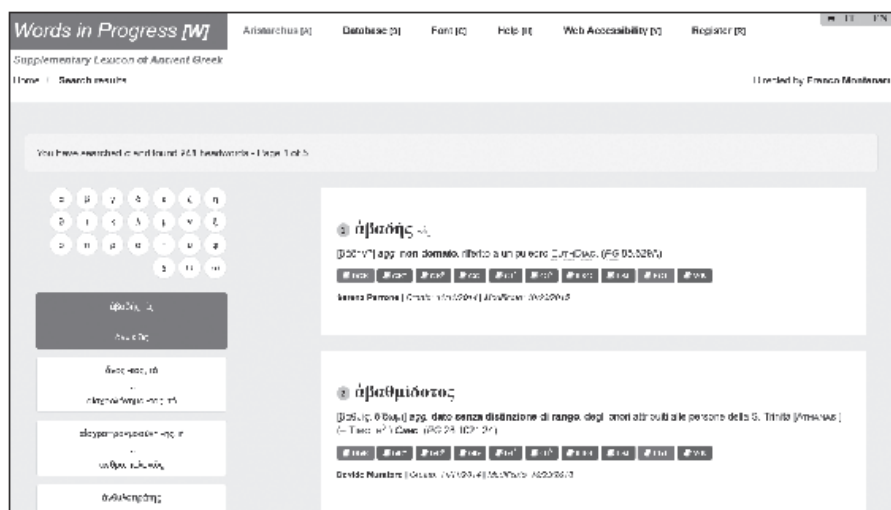
On the left of the home page, one finds the tools to browse or search in the database: an alphabetic word list; a reverse alphabetic word list; a list of words arranged by texts; a text string search box. The dictionary gives a Spanish translation of each term, followed by the quotation and the translation of the relevant passage (the *sigla* indicating the papyri are explained in the Help tab “Ayuda”).

The very recent *Neues Fachwörterbuch* (nFWB), directed by Reinhold Scholl at the University of Leipzig, presented at the 27th International Congress of Papyrology (Barcelona 2016), is defined as a “multilingual online dictionary of the technical administrative language of Graeco-Roman-Byzantine Egypt” aimed at replacing, updating, and extending Preisigke’s 1915 *Fachwörter des öffentlichen Verwaltungsdienstes Ägyptens in den griechischen Papyrusurkunden der ptolemäisch-römischen Zeit*²⁸². The terms can be either browsed from an alphabetical list on the right, or searched for via a full-text search box in the home page or an “Advanced Search” from the left-hand menu, with possibility of querying all fields via drop-down menus or text string boxes, singularly or in combination. A typical entry presents the Greek term in Unicode, followed by an expandable list of meanings; translation in the ‘official’ modern languages of Papyrology (German, French, Italian, Spanish; Arabic forthcoming); category (“subject group”) of the term; earliest and latest attestation with link to the full text on *Papyri.info*; further attestations (linked as well); an explanation of the word, in German; geographical locations (cities/villages and nomes) of attestation, with links to *TM Places* (see above, § 3.3); chronological period of attestation; bibliographical references (“literature”). Below, an indication of the most frequent attestations as regards the nome and the period; a brief description of the attestations (e.g. a term occurring only in plural); the lemma as it appears in Preisigke’s FWB; a link to the search results for the term in *Papyri.info*; the stable URL of the lemma; the author of the lemma and the date of latest update²⁸³. The ongoing project – which belongs to the *Papyrus Portal / Organa Papyrologica* project (see above and below, § 3.6 and 6.1) – is remarkable for the concept of updating and extending an existing, outdated printed resource, in an open system fully integrated with other papyrological resources.

[illegible]

A supplement to traditional dictionaries is also the newborn database *Words in Progress* (WiP), directed by Franco Montanari on the *Aristarchus* portal (University of Genua, <http://www.aristarchus.unige.net/Wordsinprogress/it-IT/Home>). WiP – accessible to the public as from April 2017 – draws its inspiration from the former experience of PAWAG (*Poorly Attested Words in Ancient Greek*, once at <http://www.aristarchus.unige.it/pawag>), an electronic dictionary that gathered ancient Greek words that are either only scantily attested (i.e. with one or few occurrences) or inadequately (i.e. uncertainly) or problematically characterized, both from a formal and semantic viewpoint²⁸⁴. Just like its predecessor, WiP is conceived as a supplement to the existing dictionaries of ancient Greek and an improvement of Greek lexicographical studies, expanding its scope to recording corrections, additions, and improvements of all kinds involving the entries in the main existing dictionaries. The former PAWAG was not of specific papyrological nature, but the interest for papyrology was great, since several “poorly attested” words occur in papyri only; WiP relies much more on papyrological sources, being conducted in strict collaboration with the Istituto Papirologico “Vitelli” at Florence and its project of updating Preisigke’s *Wörterbuch*. It is possible to

search the databank (in Greek and Latin characters) for headwords, etymologies, translations, glosses (“Ricerca Avanzata”), or to browse the terms alphabetically (“Per iniziale”). A typical entry is made up by the headword (in bold characters), its etymology, the part of speech, a main translation (Italian, bold) sometimes followed by a short explanation, the indication of the attestation(s) (sources are abbreviated, and each abbreviation is linked to a pop-up window that clarifies it), and the indication whether (and where) the word is (or not) recorded by the existing dictionaries. Authorial responsibility is recorded at the end. Two significant improvements, with respect to PAWAG, must be noted. First, Greek is encoded in Unicode, while in PAWAG it was encoded in SuperGreek, and needed the specific font SPIonic to be installed. Even more interestingly, collaboration to WiP is open to any registered user, who can submit new lemmas, which will be checked by an editorial board. The collaborative methodology, mentioned above in the Introduction as a growing trend and largely deployed by *Papyri.info* (see below, §§ 8,5 and 9, for discussion), is perhaps the more significant progress of this fundamental lexical resource²⁸⁵.



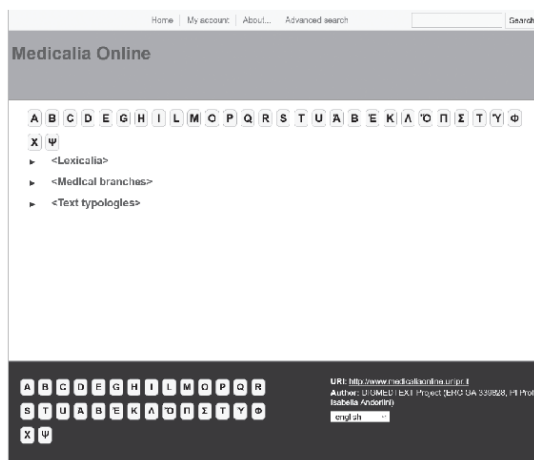
An interesting special lexicographical project, a *Database and Dictionary of Greek Loanwords in Coptic* (DDGLC), is under development by a team led by Tonio Sebastian Richter at the University of Leipzig. The database (<http://research.uni-leipzig.de/ddglc>) is not yet available, but one may already find such useful resources as a comprehensive bibliography on *Linguistic Borrowing in Egyptian-Coptic*, an index to the lexical cards by G. Bauer, some demonstration videos of the database concept and structure²⁸⁶.

Let me mention here also the *Medicalia Online* project, conducted at the University of Parma in the framework of the ERC project DIGMEDTEXT directed by Isabella Andorlini (see below, § 8.7). The project, held in close collaboration with Anastasia Maravela (University of Oslo) and with the

fundamental contribution of Isabella Bonati and Francesca Bertonazzi from Parma, aims at creating an electronic lexical database (“glossary”) dealing with the technical terms of Greek medical papyri, linked to the main core of the digital *corpus*²⁸⁷. The focus of the glossary is linguistic, papyrological, archaeological, and scientific at the same time. The resource, built on an open-access *TemaTres* platform (<http://www.papirologia.unipr.it/CPGM/medicalia/vocab>), has different ways of use. In the home page, one can find a threefold subdivision by categories (“Lexicalia”, i.e. word typologies; “Medical branches”; “Text typologies”), each of which is further divided into sub-categories – creating a sort of taxonomical classification of the terms. On the top, a row of characters, both Latin and Greek, allows browsing the terms and the categories alphabetically. A full-text search and an “Advanced search” in all fields²⁸⁸ are implemented.

The methodological approach is interdisciplinary and involves a comparative examination and a thorough analysis of all the sources available for each term, critically comparing written sources (papyri, literary passages, inscriptions, *tituli picti*) with the available archaeological artefacts. This methodology results in an innovative lexicographical structure of the lemmas. Each entry is divided into thematic boxes, called “notes”. “Variants” registers Greek and Latin variants of the name, both grammatical variants such as diminutives and phonetic or spelling variants as attested in the papyri. “General definition” provides a quick, dictionary-like definition of the term. “Language between text and context” (formerly titled “Linguistic section”) aims at depicting a linguistic overview of the term or text typology, from the viewpoints both of general historical linguistics (etymology, linguistic commentary) and of papyrology (abbreviations in the papyri). “Testimonia – A selection of representative sources” lists some relevant literary and papyrological passages where the term is attested or samples of the text typology discussed; each quotation is reported in full text with English translation. “Commentary” is the most extensive section of the lemma, tracing an overall contextualization in the broad historical and textual framework (whether medical literature, medical papyrology, or medical archaeology). “Bibliography” is divided in “Lexicon entries” (dictionaries, glossaries, etc.) and “Secondary literature” (studies); bibliographical abbreviations point to an ongoing general medical bibliography to be built by the research team²⁸⁹. A list of papyrological references closes the lemma: the documentary evidence (“DDbDP references”) will be linked to the appropriate texts on Papyri.info, the literary or paraliterary one (“CPGM references”) to the forthcoming texts on DCLP (see further on, § 8.7), from which, in turn, it will be possible to insert links back to *Medicalia Online*. The author of the lemma is mentioned at the end. As is apparent, the goal of *Medicalia Online* is wider than providing a medical papyrological dictionary: through an in-depth study of the terms attested in medical papyri, it aims at enriching our views about ancient medical language compared to and integrated with the literary sources and the

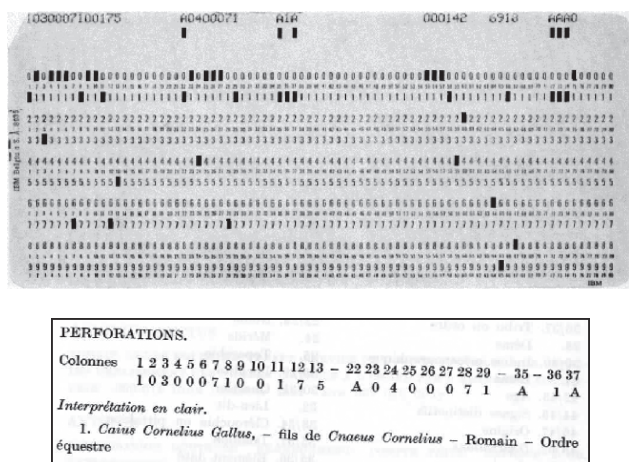
archaeological testimonies of ancient medicine, and at the same time at shedding new light on the diachronic, often problematic developments of the technical terminology employed by ancient medical writers into the modern languages and contemporary scientific discourse in medicine. Due to its ample scopes, the project is still ongoing and one may find online just provisional samples; the high degree of details collected allowed for several publications about the matter²⁹⁰.



4.4 Prosopographies and Onomastica

Indexes of individuals and/or of personal names are not a secondary resource in Digital Papyrology: as we noticed above (§ 3.3), it was from a digital version of the renowned *Prosopographia Ptolemaica* that the ‘thrice greatest’ *Trismegistos* arose. It is certainly not by chance that at the 11th International Congress of Papyrology (Milan) in 1965, about twenty years before the *ProsPtol Online*, Alfred Tomsin, a Belgian papyrologist from Liège and a true pioneer of Digital Papyrology (we mentioned him in the Introduction, § 1.1, and we will encounter him again later on, §§ 7.1 and 8.2), presented a project for a prosopography of Roman Egypt. In Tomsin’s idea, this would have complemented the *Prosopographia Ptolemaica* (then a printed resource only) on the Roman side. Foreseeing many complications in managing, classifying, and exploiting the huge amount of data that would have been generated by such an enterprise, Tomsin proposed to rely on the “ordinateurs électroniques” that, at those times, worked with punched cards (the data input was given by means of cards punched according to precise combinations in rows and columns). It was the very dawn of computational philology and linguistics: only four years before Tomsin’s paper, in Liège, Louis Delatte had founded the Laboratoire d’Analyse Statistique des Langues Anciennes (LASLA) in order to study ancient texts with the help of electronic calculators (see above and below, §§ 3.2, 7.1, and 8.2). Tomsin described very

precisely how the prosopography was to be conceived and structured in order to encode the information in machine-readable format²⁹¹.



Tomsin's project –at the very dawn of Digital Papyrology – never took off, but after the experience of the *Prosopographia Ptolemaica* and its confluence into *TM People*, we still look at prosopographical databases with much interest. *Dime Online* is an example; and likely also the *Mummy Label Database* may turn, at least in part, to be a prosopographical resource (see above, § 3.5).

Indeed, a very similar tool is announced on the *PSIonline* platform: a “guida informatica alla prosopografia dell'Arsinoite” designed by the University of Padua and the King's College, London²⁹². In the framework of this project, conducted by Silvia Strassi, Matilde Fiorillo, and Dominic Rathbone, a very recent (2015) workshop was held to discuss methodological and technical issues of a prosopographical database of the entire Roman Egypt (*Digitalized Prosopography of Roman Egypt* = DPRE), in the wake of a previous project, dating back to the early Nineties, launched at the King's College by Dominic Rathbone himself, and called *Computerized Prosopography of Roman Egypt* (CPRE)²⁹³.

While *TM People* (see above, § 3.3) remains of course the major resource in this sector²⁹⁴, some other thematic prosopographical or simply onomastical lists are also provided by single projects, usually as static PDF or HTML files.

The *Onomasticon Oasiticum*, a list of the personal names attested in documentary texts coming from the Theban Oasis in Graeco-Roman times, has been compiled by Robert P. Salomons and Klaas A. Worp as a PDF file (http://media.leidenuniv.nl/legacy/onomas_final.pdf, July 2007; revised version September 2009). As described in the introduction, the onomastic interest of both editors stems from their own involvement in the publishing of several documents from the Dakhleh and Khargheh Oases, especially considering that a printed prosopography of that area, announced by Guy Wagner²⁹⁵, had never appeared. The *Onomasticon Oasiticum* is divided into

three parts: the *Onomasticon Hibiticum*, for Khargeh; a transition section with a list of names of people who certainly lived somewhere in the Great Oasis, but without certainty on the exact area; the *Onomasticon Mothiticum*, for Dakhleh. In this third part, after the Greek entries follows a section containing the names found in Coptic documents. The structure is very simple: the names are listed alphabetically, and the occurrences are given in a column to the right.

A plain PDF is the format chosen also by Monica Hasitzka for her *Namen in koptischen dokumentarischen Texten* (https://www.onb.ac.at/fileadmin/user_upload/PDF_Download/1_PAP_kopt_namen.pdf, latest update January 2007). As the author states in the introduction,

Namen in koptischen vorwiegend dokumentarischen Texten sind bekanntlich so gut wie nicht gesammelt. Das gab den Anlaß, für die eigene Arbeit ein einfaches Hilfsmittel in der Verzeichnung von Namen und Stellen (ohne Analysen oder weitere Untersuchungen) herzustellen.

The file is indeed a simple alphabetical list, with reference to the occurrences (bibliographical abbreviations are explained at the beginning); variant forms point to the main form.

A *Prosopography of the Cynopolite Nome* is offered by Nikos Litinas in both DOC and PDF formats at http://www.philology.uoc.gr/ref/Cynopolite_Nome (latest update November 2005). A single-page PDF (“Lower Cynopolite Nome”) records the occurrences and bibliography of the Lower Cynopolite Nome (it is discussed whether it was part of the same nome as the Upper Cynopolite, or not). It acts therefore as a very short topographical index. The file called “Tables” contains first a “List of the Upper Kynopolite Nome Papyri” (i.e. “mentioning the Kynopolite nome, the ethnic of t[he?] persons, the adjective or villages of the Upper Kynopolite nome”), which is a repertory listing the papyri by edition, with reference to date and content. Then the Prosopography comes: a table arranged alphabetically by full Greek name (but the alphabetical order follows in fact the transliterations: see Βίκτωρ after Θεωνᾶς, or Ψευαῦμις between Πρωοῦς and Πτολεμαῖος); each entry features the transliteration, the person’s genealogy (patronymic, papponymic, metronymic, other relatives), some information on the individual (title, role, context, etc.), attestations, date. Some references to unnamed Cynopolite officials are appended to the end, and a short bibliography closes the file.

4.5 Indexes of Emendations

The *Berichtigungsliste der Griechischen Papyrusurkunden aus Ägypten* (BL) is well known to any papyrologist as an essential tool in dealing with documentary texts, in that it registers all the updates, corrections,

supplements, emendations – whether readings or interpretations – brought to papyrus editions subsequently to their publication. In several cases, emendations concur to update the digital texts in the *Duke Databank*²⁹⁶; but likely more are to be found in the BL volumes only, though carefully reported in the HGV metadata (see above, § 3.1). Consulting BL is therefore an unescapable editorial task. BL comes originally as a series of printed volumes, launched by F. Preisigke in 1913 (BL I, 1913–1922), continued by F. Bilabel as of 1929 (BL II, 1929–1933), and since 1952 (BL III) by the Leiden Papyrological Institute, currently led by Cisca Hoogendijk, in collaboration with colleagues from Heidelberg (formerly Marburg). Currently, BL counts 12 volumes, plus 2 volumes of concordances²⁹⁷.

It is apparent that such an instrument, as huge as useful, would take an enormous advantage of the possibilities offered by the electronic technologies, in terms of both data management (storage, retrieval) and update. Indeed, in 2009 BL editors produced a commercial CD-ROM containing a digital version of the 11 volumes up to 2002²⁹⁸. This was a very helpful tool, containing a browser-based software able to perform precise searches in the whole database in order to retrieve the corrections. Unfortunately, the program seems to have some compatibility issue with the more recent operating systems²⁹⁹ and is therefore not working properly any more. Fortunately, the BL team got extremely concerned with the digital cause, and announced some remarkable enhancements in the future releases. As we can read from their website,

Berichtigungsliste der Griechischen Papyri Band XIII is well under way. In November 2011 an international Round Table Conference was held in the Leiden Papyrological Institute on the Future of the *Berichtigungsliste* in the light of the changing digital world of papyrology. Important and far-reaching decisions have been taken concerning the digitalization of the BL and a closer cooperation with the international projects Duke Databank of Documentary Papyri, Heidelberger Gesamt Verzeichnis [*sic*] and Trismegistos. From now on, the *Berichtigungen* will be published online, although a print version of the BL (in PDF-format) will still be published on a regular basis. Thus, anticipating the publication of a BL 13 in print, the corrections will be entered into a new online BL-databank, which has direct links to papyri.info. In this way we hope in the future to reduce the sometimes long interval between collecting the *Berichtigungen* and making them available to the papyrological public³⁰⁰.

A more detailed report was delivered by Cisca Hoogendijk at the general assembly of the Association Internationale de Papyrologues, during the latest International Congress (Barcelona, August 6, 2016) and it is worth quoting it in full:

The bad news is that we did not finish BL 13 as fast as planned. This is partly caused by a lack of staff, but also due to the fact that BL 13 is a transitional volume. During the making of this volume we started using the new online BL interface, a special database created in Heidelberg, which, among other things, will enable us in the future to link the *Berichtigungen* with the information on each text in the DDBDP. From the next volume onwards, we will be able to work more efficiently. The good news is that all material for

BL 13 has now been entered into our online database, and that we have reached the stage of proofreading. You may expect to receive Berichtigungsliste volume 13 as a free PDF in the fall of this year. [...] With a view to the integration of BL material into the existing databases, we can announce that from volume XIV onwards the language will be changed from [G]erman to English, and the edition names will follow the Checklist.

Finally: in the future we are going to need your help to keep up with the published literature. In the coming year we hope to open up a website where volunteers among you can choose a book or volume of a journal in which to search for corrections. These may be formulated in your language of choice; the entries will be checked and made uniform by us afterwards³⁰¹.

Just a short remark shall be added: once more, collaboration in terms of both help with the work and sharing of the results, integration of resources, and standardization pave the way of the digital future for Papyrology, and it is extremely significant that even such a glorious resource as BL has undertaken that way.

In the meantime, updates and corrections are being added also directly to the digital editions of papyrus texts stored on *Papyri.info*, without any ‘material’ passage on paper. We will see later on (§ 8.5) how these digital emendations are produced and encoded on the platform; here we will focus on a new tool that has been implemented to track all such changes in a sort of digital BL. It is called *Bulletin of Online Emendations to Papyri* (BOEP) and is edited by the Heidelberg team composed of Rodney Ast, Lajos Berkes, and James Cowey. It is an index containing proposed emendations to Greek and Coptic texts that were entered online via the *Papyrological Editor* (see below, § 8.5), collected together for ease of reference and review. The list, compiled on the basis of the PE tags of editorial corrections, is arranged by papyrus edition (linked to the databank); in each entry, the older texts is followed by an arrow pointing to the new reading, and then by the name of the scholar, who proposed the emendation, and finally the reasons for the correction. BOEP is issued more or less regularly on the website of the Heidelberg Institute of Papyrology (<http://www.uni-heidelberg.de/fakultaeten/philosophie/zaw/papy/projekt/bulletin.html>); so far 7 issues have appeared (1.1: February 2012; 1.2: July 2012; 2.1: January 2013; 2.2: August 2013; 3.1: December 2013; 4.1: December 2014; 5.1: January 2016; 6.1: March 2017). An issue typically reports the emendations proposed as from the publication of the preceding one, plus some not recorded earlier. Issue 5.1 records also the first cases of born-digital editions, for which see further on, § 8.6.



Startseite

Papyrologie

Institutprofil & Sammlung

Aktuelles

Forschungsergebnisse

Mitarbeiter

Bibliothek

Projekte

Lageplan

Links

Presse & Archiv

Über das Institut > ZAW > Emendations > Projekte >

Bulletin of Online Emendations to Papyri (BOEP)

- 5.1 (January 7, 2016)
- 4.1 (December 3, 2014)
- 3.1 (December 19, 2013)
- 2.2 (August 3, 2013)
- 2.1 (January 15, 2013)
- 1.2 (July 25, 2012)
- 1.1 (February 8, 2012)

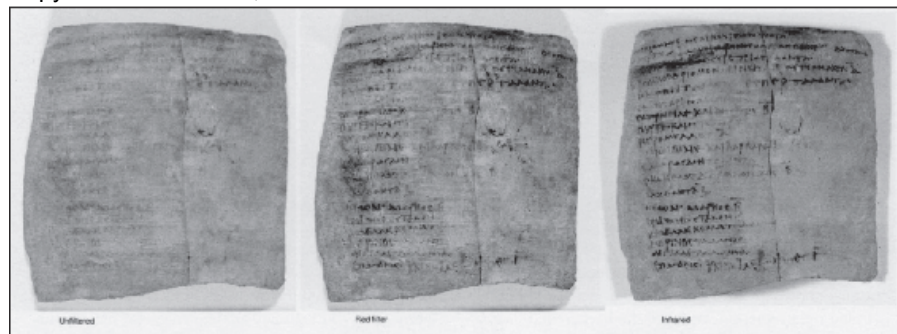


Figure 2: monochromatic green illumination [P.Duk.inv. 716.1-3].



Figure 3: 900 nm filter and modest digital sharpening [P.Duk.inv. 716.1-3].

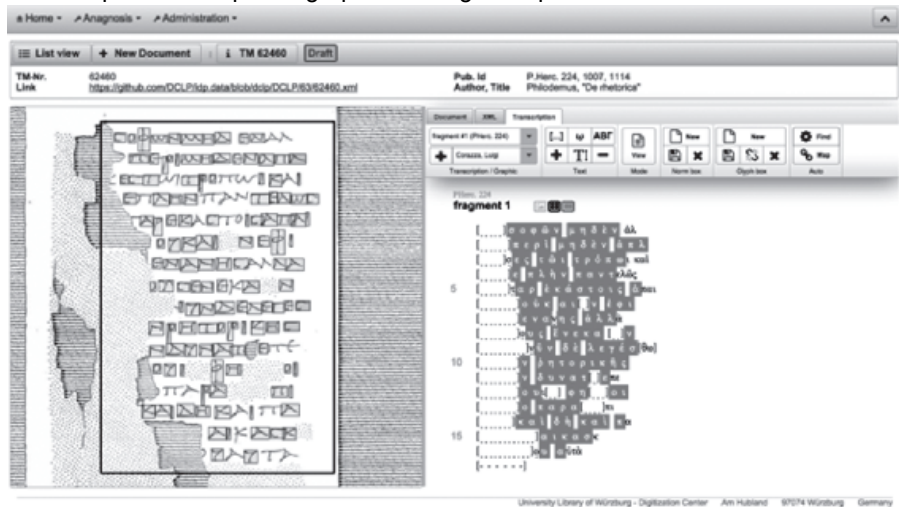
Papyrus enhancement, from OATES - WEINBERG - SOSIN - JOHNSON 1999.



Ostrakon enhancement, from BÜLOW-JACOBSEN 2008.



The computer-aided palaeographical recognition process in *Ancient Lives*.



The *Anagnosis* alignment process (from the website).

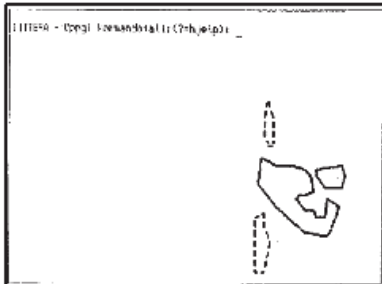


Fig. XXIII. Fragments from an unregistered papyrus (P. 100, 27, column 1 (P. 100, 27, column 1)). The dotted lines above and below the fragments represent the original shape and color.

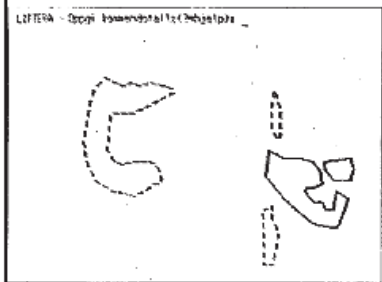


Fig. XXIV. Same as Fig. XXIII.

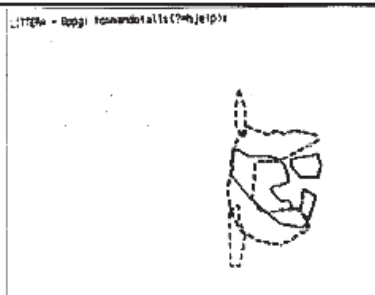


Fig. XXV. Same as Fig. XXIII.

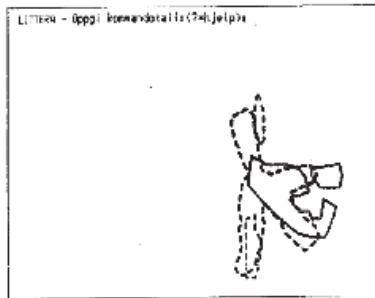
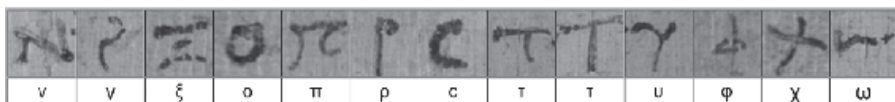
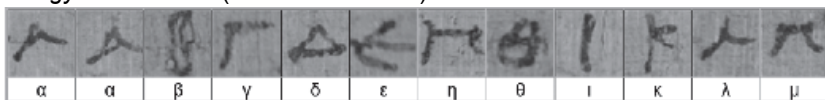


Fig. XXVI. Same as Fig. XXIII.

Literology screenshots (from KLEVE 1981).



sample palaeographical dataset, from <https://www.lib.umich.edu/reading/Zenon/paleography.html> (note the two different alphas, nys, taus, in order to take into consideration all the possible shapes).

5Virtual Papyrology

In photography there is a reality so subtle that it becomes more real than reality.

Alfred Stieglitz

Imaging papyri is a major issue in conservation and research. Taking photographs, generally speaking, is a way of preserving a memory and spreading what is portrayed. The picture of a papyrus can survive material decay, can be copied, shared and examined without moving or damaging the original piece, can offer an enhanced view of the object; it is also a fundamental resource for sharing and accessing knowledge. As Roger Bagnall

put it,

[p]apyri pose significant challenges for both preservation and access: for preservation because of the damaged and fragmentary condition in which most papyri have survived, and for access because almost all research in papyrology involves studying pieces in many scattered collections. Sometimes fragments of a single papyrus may be found in several locations, and, still more commonly, related papyri are distributed in many libraries and museums. Published editions usually (for reasons of cost) include half-tone plates of only a selection of texts³⁰².

It is essential, for papyrological research, the autoptical recognition of the papyrus as a material object bearing text, and photographs are usually considered as valuable substitutes of the original pieces (if they are of acceptable quality, of course!). I am not going to deal with ‘traditional’ (analogue) photography of papyri; suffice it to recall the big international efforts to create large photographic archives (both already mentioned apropos of catalogues, § 3.6), like the Photographic Archives of Literary Papyrology founded by P. Mertens at the CEDOPAL³⁰³, and the International Photographic Archive of the published Cairo papyri³⁰⁴. Photography helped recording, reading, comparing³⁰⁵, but did not solve all the problems:

[e]ven with the growth of air travel in recent decades, visiting all relevant collections is rarely an option, and scholars are therefore faced with two unappealing choices: order conventional photographs usually slow to arrive and often prohibitively expensive, or use only published papyri and, even with those, be unable to check the editor’s text. Color slides, experimented with in some European collections in recent years, have some advantages over black-and-white prints, but the quality and convenience of the viewing technology usually are deficient³⁰⁶.

It was under these circumstances that digital technologies burst on the scene, improving the concept of “preservation in the service of access and research”³⁰⁷.

5.1 Imaging Papyri Digitally for Preserving and Reading

It has been clear for some years that digital imaging offers the promise of more satisfactory solutions to these problems. Digital imaging provides an opportunity to create a worldwide virtual library of images, freeing scholars and students no matter where they are located to study all relevant papyri in any collection. Such a ‘library’ would encourage wider use of papyrological texts in study and teaching about the ancient world and greatly improve the quality of research. At the same time, the ready availability of images could help reduce the physical handling of the original objects and thus help prevent further damage. These benefits also are relevant to the other writing-bearing objects generally classed with papyri, like potsherds (ostraca) and wooden tablets³⁰⁸.

It was for the first big projects of cataloguing papyri on a large scale that the

first experiments to take digital photographs of papyri were carried out – indeed, “Ohne Katalogisierung sind die Bilder nur die Hälfte wert”³⁰⁹. It was namely the APIS project that joined the development of digital cataloguing of metadata with the issue of digital imaging (see above, § 3.6). Bagnall’s 1995 report to the Commission on Preservation and Access³¹⁰ on “Digital Imaging of Papyri” is in fact the very first official theoretical outcome of this view. The goal of his report was to “document how to best scan papyri in anticipation of a major effort among papyrologists to digitize their collections”, and it deals with numerous issues about methodology (the establishment of unavoidable shared and common standards) and technical opportunities (e.g., the use of digital cameras instead of flatbed scanners³¹¹).

One of the first concerns was indeed, as usual, standardization: how to ensure a common and fixed technical high-quality level for taking, storing, and publishing digital pictures of papyri³¹². Another big concern, ça va sans dire, was the integration of the digital pictures in the other existing or forthcoming resources. “The digital imaging of papyri is part of a larger set of developments”, did write Bagnall himself a couple of years after the Report: “papyrological use of imaging is part of a broader introduction of imaging into scholarship in the humanities and [...] images of papyri are only part of a larger change in the ways that papyrologists use information and do their work”³¹³. With the Michigan and Duke digital projects as the starting point, from 1991 and 1992 onwards, digital imaging became a core element of the APIS project³¹⁴, and subsequently of almost all cataloguing projects of papyrus collections worldwide³¹⁵. The digitisation of the International Photographic Archive of the Cairo papyri, as well as that of the CEDOPAL Photographic Archive, started in 2003 “[e]n vue de pérenniser sa collection de reproductions et de la mettre plus aisément à la disposition de la communauté scientifique internationale”³¹⁶, are somehow different, since they did not deal with original papyri but with analogue photographs, but undoubtedly go in the same direction³¹⁷.

Beside preservation, digital images have expanded very much the chances of reading. The ease of access increases the opportunities to check the original texts³¹⁸ and to collaborate more efficiently³¹⁹; the high degree of detail highlights the material context in an unprecedented way; the possibility of digital processing (i.e. manipulation), thanks to appropriate graphic software (enlargement, colour settings, contrast adjustment, etc.), enhances the legibility of the texts³²⁰. Of course, to enlarge a digital picture without quality loss³²¹, as well as to render any minimal detail, which can prove essential in understanding a text, it is necessary to produce an original image of appropriate high definition³²².

Lately, it is not rare that such pictures are attached to the edition volumes, in a CD-ROM or a DVD, or even online, instead of the traditional photographic tables³²³; conversely, documents exhibiting a hefty materiality like ostraka may suit 3D scanning. Indeed, the recent digitisation of the

Leipzig papyrus collection for the Papyrus Projekt Halle-Jena-Leipzig (see above, § 3.6), and in particular the Ostraka-Projekt (2009–2012), experimented the 3D modelling of ca. 55 potsherds, generating a three-dimensional interactive view, both coloured and infrared, to enhance contrast. The data, captured with an X-ray microcomputer tomography, were processed as volume surfaces in STL format (stereolithography, i.e. description of the surfaces of three-dimensional bodies with triangular facets) and subsequently turned into interactive 3D objects displayed in the online catalogue³²⁴.

Further digital strategies to virtualize papyri in order to improve their legibility are discussed below.

5.2 Reading Invisible Ink

Digital imaging has enhanced the possibility of taking photographs in frequency (wavelength) ranges beyond visible light. This proves particularly helpful when dealing with dark, dirty, or even carbonized papyri, where the lack of contrast between writing and background makes deciphering difficult, if not impossible. In some cases, it has been recognized that a slight enhancement could be obtained by capturing the deep red / near infrared / infrared spectral ranges, especially because surface texture reflectance is reduced at longer wavelengths, and therefore infrared light can penetrate deeper and reveal soaked traces of the carbon-based ink, which strongly absorbs infrared radiation; the methodology is indeed called ‘infrared reflectography’. CCD cameras³²⁵ with their low-pass filter removed are sensible enough to record such emissions, under the appropriate light, and can elaborate them into a digital picture, which can be further processed and enhanced³²⁶. More recent digital cameras, naturally sensitive to infrared light, can do the same work, when properly converted³²⁷. In some cases of carbonized papyri, another device called Video Spectral Comparator gave interesting results:

[t]he physical make-up of the carbonized materials is such that different pieces and different sections thereof respond differently to different technologies, lightings, and environments (humidity and heat seem to be important and related causes of varying results)³²⁸.

[W]ith the digital technique now available, an infrared photograph is nearly always worth making. Whether the papyrus is difficult or just normally darkened, it will bring out contrast and make a better overall impression³²⁹.

Even the Posidippus and the Artemidorus papyri recently took advantage of the infrared digital technology³³⁰.

In 1998, at the 22nd International Congress of Papyrology in Florence, a team from the Brigham Young University of Provo (Utah, USA) presented a

revolutionary method, called Multispectral Imaging (MSI), particularly effective in case of dark papyri, especially carbonized³³¹. The method had been tested on the Petra papyri (Church texts of interest to the Foundation for Religious and Mormon Studies and the Center for the Preservation of Ancient Religious Texts at BYU)³³², and then successfully applied several times to various Herculeum papyri³³³, as well as to the Derveni roll, to some Tebtunis and Oxyrhynchus papyri at Berkeley and Oxford respectively³³⁴, and to the recently published 5th-century-BC papyrus of Daphne³³⁵. It was originally developed for astronomical photography, and it is based on the application of different filters to capture a series of images of the same target at various wavelengths of light, from ultraviolet to infrared; it seems that the Herculeum papyri better react in the near-infrared range, while the Petra pieces in the near-ultraviolet area³³⁶. It is a particularly complex method, in that it requires the work of two calculators – one to manage the framing, the other one to process the images –, a professional digital camera with an appropriate set of filters, a four-lamp lighting system³³⁷. For this reason, and because most of the papyri seemingly response to infrared only, Adam Bülow-Jacobsen argued that plain infrared imaging would suffice in most of the cases³³⁸; it is however to consider that

[s]ince archaeological objects tend to be heterogeneous, as are texts and many of the ostraca, it may easily turn out that specific areas on a given object may respond better at different wavelengths. When portions of a single textual artifact respond differently at different wavelengths, narrow-band spectral imaging can be a better choice than monochromatic or even integrated near-infrared imaging [...]. MSI and infrared imaging are not competing approaches. The latter, in fact, is an important subset of the former. In many instances wide-band monospectral infrared imaging [...] will prove to be the most practical solution. However, for archival and scholarly purposes in which it is desirous to ensure that the maximum amount of text is legible, MSI, which provides considerably more data, is clearly advantageous³³⁹.

A somewhat earlier method, similarly applied to papyri, was called Particle-Induced X-ray Emission (PIXE). The method is essentially an X-ray spectrometry and had been systematically utilized since the '70–80s in order to determine the elemental composition of ink and paper of old manuscripts without damaging the artefact: an accelerated proton beam hits the target, determining X-ray photonic emission, the energy of which characteristically vary according to the chemical elements³⁴⁰. Since the emissions of ink are different from the emissions of the papyrus material, this method could also be used to detect any remainders of ink otherwise invisible, and in the Nineties it has indeed been used to decipher illegible text on papyri, by applying an appropriate pixel-by-pixel multivariate analyses processed by a computer in order to highlight the contrast between the ink and the papyrus pixels³⁴¹.

More recently, another opportunity offered by digital imaging to better virtualize papyrological artefacts and improve their deciphering and reading is

three-dimensional (3D) imaging³⁴². This innovative methodology was applied first by a team led by Alan Bowman to incised material like wooden stylus tablets (formerly wax tablets, with the wax now perished, leaving the underlying surface scratched by signs) or lead curse tablets. Such documents, indeed, at the borderline between papyrology and epigraphy, bring somewhat different problems than ink-written material, where the issue at stake is the colour contrast between ink and surface, since they involve three-dimensional analysis of almost illegible incisions. Traditional computerized techniques like stereovision and photogrammetry were not applicable due to the very small disparities between the text incisions and the depth variations of the surrounding surface. Bowman and collaborators decided to exploit a technique developed originally for the computation of three-dimensional shapes from shading variations: by deliberately varying the lighting, one can estimate the three-dimensional relief of a surface. The light is cast and varied so that incisions can be distinguished from the surrounding surface, and different hands can be recognized. Shadow-stereo and reflectance transformation imaging allow capturing and encoding multiple images of the text under varying lighting conditions for further processing (e.g. woodgrain removal) and visualization. Subsequently, particular image processing algorithms are applied to isolate the text features (e.g. segmentation of the image obtained by combining overlapping highlights and shadows; region labelling approaches considering the probability for a pixel to belong to one or another region of the image; phase congruency to detect text features)³⁴³.

A slightly similar technique, Reflectance Transformation Imaging (RTI) – which captures surface shape and colour of an object and allows for its interactive relighting from any direction, enabling the mathematical enhancement of the surface attributes – has been experimented with satisfying results on the carbonized Derveni papyrus, also in combination with infrared capture (IR-RTI), obtaining a great enhancement in the legibility of the artefact and envisaging further developments in such a kind of digital imaging technique³⁴⁴.

3D modelling can be successfully applied to written objects that present peculiar dimensional deformations. An attempt was made with a 17th-century parchment book severely damaged by a fire³⁴⁵, but such an approach has been considered for papyri too. An experimental 3D scan, conducted by Hubert Mara and Patrick Sängler in 2010 in Heidelberg, showed that no text feature is actually improved, nor even legible at all, but the 3D scan of the papyrus gave an extremely precise detail of the outer appearance of the surface (namely the twine of the fibres), which might lead to interesting outcomes in joining and restoration issues³⁴⁶. Similar experiments have been conducted also on carbonized papyri at Helsinki, with the very same results³⁴⁷.

5.3 Virtual Restorations and Reunifications

The papyrological outcome of digital imaging is not limited to preservation, accessibility, and deciphering:

Risultati eccellenti possono essere conseguiti con l'impiego delle tecnologie digitali nel collegamento 'virtuale' di materiali di lavoro conservati divisi tra Istituzioni o Musei di tutto il mondo, depositari delle raccolte di papiri; una volta riconosciuti a distanza dagli studiosi come pezzi di uno stesso originale, i frammenti di papiro non devono essere materialmente spostati e ricongiunti per lo studio e la pubblicazione. La simulazione dello spostamento concreto di pezzi divisi di fatto, ma appartenuti ad un medesimo originale, è brillantemente operata dai software di gestione di immagini e il movimento del mouse subentra alle tradizionali operazioni meccaniche di restauro manuale con pinzetta e pennello. La tecnica del restauro 'virtuale' ha anche il vantaggio accessorio, ma non indifferente, di tutelare la sicura conservazione dei materiali originali, evitando lo stress fisico che i frammenti papiracei, di solito stabilmente conservati tra due vetri che proteggono i fragili bordi di frattura, potrebbero subire nei ripetuti tentativi di accostamento per la ricostruzione di pezzi più grandi. D'altra parte, la procedura del restauro 'virtuale' di reperti di collezioni diverse e distanti è un incentivo prezioso al proficuo scambio di esperienze di lavoro, offrendo l'opportunità di instaurare collaborazioni a distanza, di mettere a contatto approcci diversi allo stesso campo di studio, e di far interagire *background* culturali e mezzi tecnologici differenti³⁴⁸.

The case described by Isabella Andorlini is of wide proportions, implying the virtual reunification of fragments scattered around the world³⁴⁹, but virtual (or digital) restoration can be carried out also within a single collection, or even for one papyrus³⁵⁰: it is essentially the virtual manipulation or displacement of digital fragments to recreate the original aspect of a document scattered in scrambled fragments or dispersed in different places. It involves enhancing³⁵¹, resizing, rotating, moving the digital images of the fragments with any photo editing software. The results can be very relevant (see the Codex Sinaiticus Project below, 8.6), but also elegant: the website of the Institute of Papyrology of Sorbonne University offers an entire page with a collection of virtual reconstructions ("Virtualia": <http://www.papyrologie.paris-sorbonne.fr/menu1/Virtualia.htm>) of interesting papyri preserved in that collection, both literary (Menander's Sikyonios, for example) and documentary (like cadastres and accounts), whether rolls or codices (such as the school notebook P.Bour. 1): "[d]ésormais, malgré leur taille ou leur conditionnement par exemple, ces documents sont enfin accessibles – virtuellement – dans leur composition originelle!". This activity, usually limited to single study cases³⁵², can be enjoyed also by non-specialists: around the Web there are some demonstrative Flash applets that reproduce fragmentary papyri, and anyone can feel the thrill of moving and rotating the fragments to solve the puzzle³⁵³. While still waiting for a possible algorithm that could reunify fragments automatically³⁵⁴, we can go on playing around with the mouse looking for the best place to put

that tiny scrap.

A particular instance of virtual restoration is the virtual unrolling of carbonized papyri. The long-standing issue of how to open the Herculaneum rolls hopefully without destroying them too much³⁵⁵ seems to have found a new promised land in the digital techniques. We have already noticed how some advanced imaging technologies (namely infrared and multispectral methods) have been successfully applied to the reading of such desperate pieces; but they were used with already unrolled fragments. What is at stake here is the possibility to unroll the compact mass of the carbonized rolls (namely, those from Herculaneum) without damaging the material, as evoked by Francesca Longo Auricchio at the 25th International Congress of Ann Arbor, in 2007³⁵⁶. Doing that in a non-invasive virtual environment seems to be the optimal solution.

In 2006, at the Friends of Herculaneum Society (Oxford), Brent Seales (University of Lexington, Kentucky) presented an innovative project for ‘scanning’ a rolled-up papyrus by means of a combination of nuclear magnetic resonance (NMR) and X-ray tomography. After suggestion by Daniel Delattre, this method was applied to a carbonized roll in 2008, and it resulted that NMR was able to reproduce virtually the roll layers and to detach them, thus creating a sort of ‘map’ or ‘model’ of the internal structure of the roll, important for any possible future mechanical interventions³⁵⁷. In 2009 the project EDUCE (Enhanced Digital Unwrapping for Conservation and Exploration) was established and a couple of rolled-up carbonized papyri (P.Herc.Paris 3 and 4) were analysed with micro computed tomography, “an X-ray based imaging technique that produces a three-dimensional volumetric view of the interior of opaque objects. [...] A CT scan represents an object as a set of 2D slices, each corresponding to one cross section, that when stacked together and properly processed form a 3D picture”³⁵⁸. Further digital processing involves segmentation (modelling shape and position of the underlying layers), texturing (assigning different brightness to different areas of density), flattening (unwrapping the layers), merging the resulting images³⁵⁹. The experiment was successful, and the internal structure of the roll was perfectly unveiled in every detail, though no text was visible yet: “[t]his is likely due to the use of predominantly carbon black inks, which have a much lower contrast to the papyrus substrate than pigments with metallic bases”³⁶⁰. Metal-based is, on the contrary, the ink of the carbonized En-Gedi parchment scroll, which was successfully unwrapped and read virtually by means of micro computed tomography last year³⁶¹.

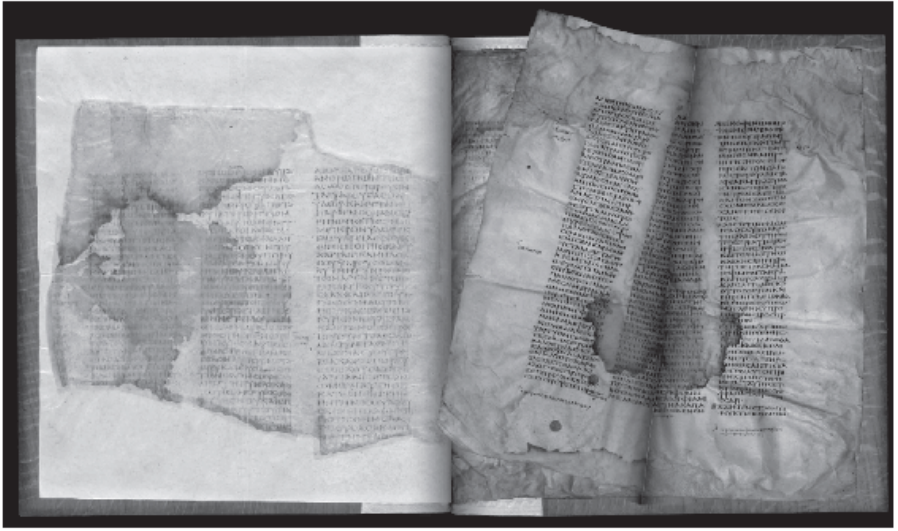
Since image contrast depends on differential X-ray absorption by the different substances, X-ray phase-contrast tomography (XPCT), an advanced technique developed at the European Synchrotron Radiation Facility (Grenoble) was subsequently applied. “Unlike XCT, XPCT exploits variations in the refractive index (that is, X-ray phase shifts) between structures that absorb quite uniformly within a composite object, thus significantly

enhancing the image-contrast effect”³⁶². It resulted in “the first non-destructive technique that enables us to read many Greek letters and some words in the interiors of rolled-up Herculanum papyri”³⁶³ and, despite the need for further refinements, it opened a new, virtual era also for Herculanum Papyrology³⁶⁴.

A peculiar case that put together 3D modelling and virtual restoration is the test study presented by Ségolène Tarte in 2012. In this case, the target was the Artemidorus papyrus, and of course the issue was not unwrapping it, but the opposite, rolling it up, in order to verify some hypotheses about the relative positions of some sections of the roll³⁶⁵. Digital images of the recto and of the mirrored verso were first matched exactly, in order to re-establish the physical correspondence between them. Then the Archimedes’ spiral model³⁶⁶ was adopted to reproduce the virtual rolling of the papyrus³⁶⁷. The experiment also produced interesting methodological and even epistemological outcomes:

This demonstrates how digital images not only take part in the act of papyrological interpretation, but also are interpretations in and of themselves. By their nature, digital images enable us to re-materialize the artefact, to underline the extent to which its materiality is re-assessed through the digital; they take their part in the trail of evidence that substantiates papyrological interpretation. Digital technologies have the potential to transform methodological approaches in papyrology; even if they have weaknesses, such as adhering to an ideal model, they nonetheless allow us to minimise some aspects of the uncertainties present in traditional methodologies³⁶⁸.

A completely re-materialized artefact is indeed the digital version of the Edwin Smith papyrus, the famous hieratic surgical papyrus which has been scanned and processed by the US National Library of Medicine in order to simulate the act of unrolling both recto and verso in a virtual 3D environment (<https://ceb.nlm.nih.gov/proj/ttp/flash/smith/smith.html>)³⁶⁹. This is of course a case not precisely related to Graeco-Roman Papyrology, but is an intriguing perspective to bear in mind for papyrus rolls; a browsable digital version of the Codex Sinaiticus (see above for its virtual reunification, and below, § 8.6, for its digital edition) is also available from a similar Turning the Pages project at the British Library (<http://www.bl.uk/turning-the-pages>; see picture below).



5.4 Digital Palaeography

Digital imaging and virtual rendering involve another aspect of papyrological studies: palaeography. Digital Palaeography, i.e. the application of computational tools to palaeographical studies, is a recently established discipline³⁷⁰ and I am not going to deal with it in details here. I will rather focus on the digital palaeographical tools for papyrological studies. Papyrology utilizes the analysis of palaeographical patterns mainly for (a) typological categorization (definition of the script style) (b) chronological placement (dating) (c) handwriting recognition / scribe identification (description of script features and possible identification of the hand) (d) handwriting decipherment (text recognition and transcription). As is apparent, it is again all a matter of comparison: with established categories of script; with already dated writings; with already known hands; with the alphabetic characters. It is in this respect that digital tools bring their contribution.

Since the beginnings, the main purpose of palaeographical printed reference tools is to provide solid terms of comparison for dating, and possibly deciphering, papyrus handwriting. We certainly remember of Seider's dream of a "list of all published papyri, which contained a definite date and of which there was also a published image [...], the intention being to provide a tool to help in the dating of papyri"³⁷¹, which eventually resulted, with slight improvements, in HGV. Now Digital Papyrology boasts a palaeographical tool that is very close to Seider's project: *PapPal* (*Papyrology / Palaeography*, <http://pappal.info>). This platform, edited by Rodney Ast since 2013, within the frame of the Heidelberg University's Sonderforschungsbereich 933 "Materiale Textkulturen", is essentially an

online repository of images of dated documentary papyri. “Its aim is”, as we read from the home page, “to illustrate the development and diversity of ancient scripts, and to assist in dating undated texts”. The pictures are not hosted directly, but gathered from other online resources: this fact highlights again the importance of sharing and granting access to digital photos worldwide, and makes the research outcome of digital catalogues and other repositories even more concentrated. *PapPal* allows browsing images by year, provenance, title, keyword, material, and language/script³⁷²; the images can be displayed either as a list of thumbnails in rows or as a slideshow. Each item is linked to the project that hosts the image as well as to the transcription of the corresponding text at Papyri.info, accomplishing the integration of this resource (see below, § 8.4).

Literary papyri exhibit more formalized handwritings, with less chronological variation; nonetheless, a digital palaeographical tool similar to *PapPal* would be most useful. Indeed, it has been announced by Giovanna Menci, at the 25th International Congress of Papyrology (Geneva 2010), the ongoing project for a database of alphabets called ALPHA (*Alphabet Letters in Papyri HAndwriting*) and based on the pictures recorded by LDAB. The database will be designed as a synoptic table of letters extrapolated from the digital pictures, already available or scanned from tables or photographs³⁷³.

Both *PapPal* and ALPHA are conceived to exploit digital imaging to collect comparative samples of writing, leaving the burden of effecting the actual comparisons to the scholars. However, other sectors of Digital Palaeography have already implemented automated ways to support script recognition: for example, this was announced for Greek inscriptions in 2009³⁷⁴. The perspectives are tempting: not only for the sake of dating, for which, perhaps, it would suffice to map typological samples or key features in dated handwritings, but also for identifying scribal hands. Let us think of the advantages of automating a hard work like that made by Giuseppina Azzarello “alla ricerca della ‘mano’ di Epagathos”³⁷⁵! Unfortunately, such computer-aided palaeography – which should always carefully be counterchecked by humans, in order to avoid any possible shortcoming – has not yet appeared.

As to actual decipherment itself, I am sorry to say that no tool able to read Greek papyrus fragments automatically has been developed (yet). Some computer-aided decipherment tool, through pattern recognition, is offered via the *Ancient Lives* portal (AL). This platform (<https://www.ancientlives.org>, hosted by *The Zooniverse*³⁷⁶ since July 2011, and currently being rebuilt), directed by Dirk Obbink (Oxford) and edited by James Brusuelas, stores digital images of the Oxyrhynchus papyri and allows anyone – especially non-papyrologists – to select one of them, to measure it with a digital ruler, and/or to transcribe the text with the help of a virtual Greek keyboard and of palaeographical samples that help identifying the shape of the letters (among these tools, the AL blog provides e.g. quite a useful grid indicating the probability of letter combinations in ‘standard’ Greek, see in the next page):

they click letter shapes on a fragment and use the online keyboard found lower on the screen to identify the character. They can leave comments or questions on the papyrus they are transcribing by clicking on ‘Talk’. They can also sign in and find back their transcribed papyri in the ‘Lightbox’³⁷⁷.

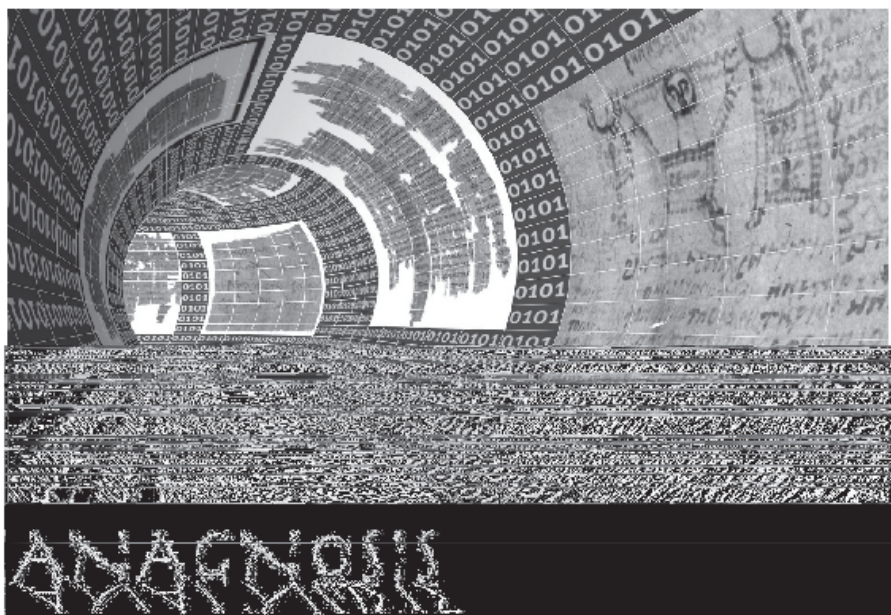
	α	β	γ	δ	ε	ζ	η	θ	ι	κ	λ	μ	ν	ξ	ο	π	ρ	σ	τ	υ	φ	χ	ψ	ω
α	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
β	1	1	0	1	1	0	1	0	1	0	1	0	0	0	1	0	1	0	0	1	0	0	0	1
γ	1	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0	0	1	0	1	0	1	1
δ	1	0	0	1	1	0	1	0	1	0	0	1	1	0	1	0	1	0	0	1	0	0	0	1
ε	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ζ	1	0	0	0	1	0	1	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1
η	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
θ	1	0	0	0	1	0	1	0	1	0	1	1	1	0	1	0	1	0	0	1	0	0	0	1
ι	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
κ	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
λ	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
μ	1	1	0	0	1	0	1	0	1	0	0	1	1	0	1	1	0	0	1	1	0	1	1	1
ν	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ξ	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ο	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
π	1	0	0	0	1	0	1	0	1	0	1	0	1	0	1	1	0	1	1	1	0	0	1	1
ρ	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
σ	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
τ	1	0	0	0	1	0	1	1	1	0	1	1	1	0	1	0	1	1	1	0	0	0	1	1
υ	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
φ	1	0	0	0	1	0	1	1	1	0	1	0	0	0	1	0	0	1	1	0	0	1	1	1
χ	1	0	0	0	1	0	1	1	1	0	1	1	0	1	0	1	0	1	0	0	1	0	0	1
ψ	1	0	0	0	1	0	1	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1
ω	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

This open ‘editorial’ work is of course subject to careful control by the project editors³⁷⁸, but the strong social involvement deserves a particular stress as a new and promising trend in Digital Papyrology (see below, § 6.2). Moreover, such an unconventional approach opens the groundbreaking prospect of storing raw (i.e. unedited) papyrological data, without word divisions and editorial conventions, which can lead to some interesting outcome such as scribal handwriting recognition, envisaged for the forthcoming upgrade of *Ancient Lives*³⁷⁹.



On a different level, the project *Anagnosis*, conducted at the University of Würzburg by Michael Erler, Holger Essler and Vincenzo Damiani on Herculeaneum papyri, is focused on the automated alignment (i.e. linking) between papyrus transcriptions and the corresponding characters of the

associated image file³⁸⁰. It is based on an online editor that displays the image, taken from online catalogues, and the transcription, which is encoded in TEI/EpiDoc XML and is part of the DCLP project³⁸¹, in parallel windows, facilitating the user-controlled linking between both sets of characters, which exploits the so called SIFT flow algorithm for aligning different scenes containing similar objects³⁸². Alignment between texts and images is a computational linguistic device that has been already developed for some interesting projects, like the *Codex Sinaiticus* online (see below, § 8.6); it is certainly a remarkable contribution to the general issue of meta-textual edition (see below, § 9), but from the close viewpoint of Digital Papyrology is also a true bridge between electronic editions and pictures, the real embodiment of the ideal of integration among databanks and catalogues: “[d]adurch soll eine Brücke zwischen papyrologischen Bilddatenbanken und der internationalen Volltextdatenbank für literarische Papyri (Digital Corpus of Literary Papyri, aufbauend auf papyri.info) geschlagen werden”³⁸³. However, *Anagnosis* is not only a bridge: a long-term goal is also to extract sample alphabets from the letters in the images, which can be used for palaeographic comparisons and for the graphic reconstruction of the gaps³⁸⁴.



An automated tool that could help in reconstructing lost or illegible text on a graphical basis is an old desideratum³⁸⁵. In the early Seventies Knut Kleve (University of Oslo), working on the Herculaneum papyri, started developing a computational method, later called *Literalogy*, which was designed to exploit an electronic palaeographical index of shapes of letters, including any scribal habit or writing characteristic, to be compared quickly (but just manually on screen) with the incompletely surviving traces in the text under

study, which consequently could be restored³⁸⁶. It was the dawn of computer tools for the humanities and the opportunities offered by calculators to the automatic treatment of the texts were explored in any possible way and direction (see also above and below, §§ 1.1, 3.5, 7.1, and 8.2). This kind of work is now made quite easily with any photo editor: the complete letter shapes are copied and pasted over the incomplete ones in order to compare the traces and hopefully discover the correct reading, or over the gaps to check possible supplements.

Today we do possess the necessary resources to build large and reliable palaeographical databases, and we may look for further automated tools. For example, Kleve noticed that the alphabetic shapes had to be stored by tracing them by hand with a digitizing tablet, and not by directly digitizing the photographs, because the computer could not distinguish between the traces of ink and other signs on the papyrus, and wished future developments³⁸⁷. Now computer graphics can enhance a digitized picture of a papyrus very much, as everybody knows (see, just for instance, Janet Johnson's documented experience of clearing digital images of Demotic words to insert in the Chicago Demotic Dictionary³⁸⁸). It is also possible, in case, to further highlight the shape of the letters, in a more systematic and articulated way than the didactical presentation on the Michigan Papyrus Collection website, a demonstration that highlights the character shape and their transcription³⁸⁹.

After all, something of the kind has been already developed for the much more complicated Demotic script. An application software (DEMOS) was designed by a team led by Edda Bresciani and Angiolo Menchetti at the University of Pisa in order to study the ostraka from Medinet Madi: it is able to store a graphical dataset of Demotic signs and combinations of signs picked from digital images and arranged in categories, and to automate a lexical and palaeographical research in a photographic archive³⁹⁰. This database is able to manage also Greek writing, in the event of bilingual documents³⁹¹. Such palaeographical datasets are the first step towards an automatic management of palaeographical comparisons for all the purposes listed above: dating; hand recognition; reconstruction; and, why not?, automated character recognition – some sort of papyrological OCR. The comprehensive *Demotic Palaeographical Database Project* (DPDP), recently launched by Claudia Maderna-Sieben, Fabian Wespi, and Jannik Korte at the Heidelberg University gets that way: its purpose is to create – on the basis of a standardized grapheme inventory – a palaeographical database connected to a text corpus, a glossary of word spellings, and an updated (and updatable) Demotic sign-list that can be of help comparing and classifying signs, and thus reading new texts³⁹². On the other hand, the palaeographical Coptic database projected by Matthias Schulz (Vienna/Münster)³⁹³ is specifically envisaged to help text reconstruction and automatic fragment siting, favouring the reunification of dispersed fragments (see above, § 5.3), thus showing the

amazing possibilities of digital palaeography.

Recently, an innovative system has been developed by Oxford engineers (especially Melissa Terras) in cooperation with the Centre for the Study of Ancient Documents (CSAD) in relation with the Vindolanda ink and stylus tablets. After having analysed the workflow of papyrologists³⁹⁴, the engineers have managed to build an intelligent system capable to be trained to effectively ‘read’ the texts and generate possible interpretations of it. This of course passed through a palaeographical mapping of the digital images. Shapes and characteristics of the letters (e.g. number, direction, and aspect of their strokes) and of other paratextual features (e.g. blank spaces, interpuncts) have been annotated with XML descriptions directly on the image, by means of an annotation software that allows to trace and label regions of a picture by hand³⁹⁵. The text has also been mapped, to extract linguistic statistics (word lists, word frequency, and letter frequency). Then the information collected have been used to ‘train’ an artificial intelligence system, originally developed for aerial image understanding (*Grounded Reflective Adaptive Vision Architecture* = GRAVA). This system allows small programme modules (“agents”) to work together to compare and contrast different types of information on the basis of the probability of an input (such as metadata describing the shape of an unknown character) matching a known model. The adapted version is composed by a “character agent”, which uses the set of character models plus data regarding the frequency of letters in the Vindolanda corpus, and a “word agent”, which uses a list of words generated from the documents read so far. The unknown shapes are entered the same way as above (tracing, annotating, etc.) and then the system compares them with the set of known characters: the less different are the more likely to be the corresponding ones³⁹⁶. As is apparent, the method is essentially based on the customary palaeographical technique of comparison, just automatically supported by artificial intelligence. In 2008–2011 the experiment developed into the *e-Science and Ancient Documents* (eSAD) project, aimed at creating computer-aided tools for reading damaged documents and to improve an *Interpretation Support System* (ISS) to facilitate researchers by tracking their developing hypotheses³⁹⁷.

“Can computers ever read ancient texts?” asked Melissa Terras during a Digital Classicist seminar at the Institute of Classical Studies, London (August 3, 2007). For now, the answer is negative³⁹⁸, because the described system still offers a range of possibilities to the researcher’s discretion, and is therefore no more than a very helpful assistant. The next challenge will be extending this apparently successful technique beyond the Vindolanda corpus³⁹⁹, and give birth to a true computer-aided Papyrology.

5.5 How Virtual Papyrology Redesigns

Papyrology

The title I chose for this part – ‘Virtual Papyrology’ – aims at making everyone aware that everything discussed above – from the plainest digital picture to the three-dimensional models, to the more complex AI systems that automatically recognize ancient characters – deals with a *digital representation* of the main objects of papyrological studies, i.e. papyri and related materials. As Melissa Terras pointed out not much time ago, such representations (or surrogates) may bear further uncertainties, beside those intrinsically embedded in fragmentary, damaged, abraded texts, mainly due to technical distortions coming from the adaptation of a material artefact to a digital medium⁴⁰⁰. This poses a big caveat, especially related to the technical standards to be developed in order to ensure a proper digital representation of the objects. Not by chance, indeed, standards have been a main concern since the first days of APIS (see above, § 5.1).

As Terras herself notes, this is by no means aimed at diminishing the reliability of digital pictures, but just to make sure that we all are aware of the fact that we are not dealing with the original, material objects, but with virtual artefacts, i.e. what Ségolène Tarte calls avatars⁴⁰¹, and that all the resources and the potentialities developed so far rely on this very fact. This leads us to a further step: the interpretative act embedded in the digitising process, as investigated by Tarte herself in a 2011 working paper⁴⁰². Several techniques and methodologies applicable to the digital representation of a papyrological object tend to reproduce the papyrologist’s interpretative acts: the author brings the example of the shadow-stereo imaging of the stylus tablets, reproducing the actual different angles from which the researcher looks at the objects; but also of 3D scanning, allowing a realistic reproduction of the materiality of an artefact, and multispectral imaging, revealing hidden text. Interaction with the digital artefact is interpretation, and thus “[d]igitization and visualization are [...] an integral part of the papyrological workflow”⁴⁰³.

The digital object – we may add – is not a mere, static copy of the original piece, but a dynamic component of papyrological scholarship, capable of reshaping the way in which we think the entire research process. In a recent lecture, Kathryn Piquette underlined what she called the “more holistic research opportunities” offered by modern imaging techniques:

Advances in modern imaging techniques are enabling the recording and study of ancient documents in unprecedented detail. The immediate material world of the document – surface colour, shape, texture, reflectance, and so on – can now be systematically documented, characterised and analysed. [...] The questions of visibility and materiality do not, however, concern only the physiological capabilities of human vision or its technological augmentation. It is also ontological – how we choose to look and what we think we see. Written objects are often accorded a certain passivity whereby they are seen as somehow immaterial and disembodied. Substrate and constrate may be conflated and detached from their wider material and social world. High-resolution imagery can provide a window onto that wider context, revealing in compelling detail traces of embodied

agency or other processes that gave rise to the creation and survival of ancient text-objects⁴⁰⁴.

This is a central point on which we will return further on (§ 9).

6Papyrological Mass Media

As though she had entered a fable, as though she were no more than words crawling along a dry page, or as though she were becoming that page itself, that surface on which her story would be written and across which there blew a hot and merciless wind, turning her body to papyrus, her skin to parchment, her soul to paper.

Salman Rushdie

It has been recently noted that Dan Brown, in his famous and much discussed *Da Vinci Code*, confused codices with scrolls apropos of the Nag Hammadi papyri, and that this was likely due to the ever-fascinating imagery of ‘papyrus rolls’⁴⁰⁵. ‘Papyri’ are always a hot topic with fascinating implications, and Papyrology, which of course deals also with codices and other writing materials, does not miss the occasion represented by the worldwide development of digital mass communication media to spread its scientific word on the subject – we can just recall, for instance, the recent discussion of the Coptic papyrus fragment mentioning Jesus’ wife, started with a scholarly publication and ended with an online investigative report⁴⁰⁶. This chapter is intended to be a survey – typological rather than exhaustive – of the papyrological dissemination on the Web⁴⁰⁷.

6.1 Websites of Institutions (Associations, Research Centres, Collections)

Institutional websites aim at providing information about the existence and activities of papyrological associations, research centres, and collections⁴⁰⁸. Of course, we shall start from the website of the Association Internationale de Papyrologues (AIP), <http://www.ulb.ac.be/assoc/aip>, where one can find pages about the history of the association, the concept of *amicitia papyrologorum* (see above, § 1.1), institutional information, an alphabetical list of members and of centres of papyrological studies worldwide, obituaries. The photographic gallery of deceased AIP members deserves a particular mention: “if the possibility of tying faces to scholarship – of glimpsing the great men and women of the past – is an aspect of modern technology, it is also a further way of gaining a sense of our tradition”⁴⁰⁹. The website provides some

recommendation guidelines for text editions and for the commerce in papyri, as well as a collection of links to other papyrological websites and resources.

Another important association is the American Society of Papyrologists (ASP), on the website of which (<http://www.papyrology.org>) one can find institutional information, and also pages about ASP publications (the periodical *BASP* and the series “American Studies in Papyrology”, “Classics in Papyrology”, and “BASP Supplements”), the summer institutes in Papyrology (advanced seminars of papyrological training), some news and memorials.

On the website of the glorious Egypt Exploration Society (EES), <http://www.ees.ac.uk>, beside the usual practical information, one can find a section devoted to the Society’s research, current fieldwork and activity, among which we can point out the page about the Oxyrhynchus Papyri Collection (<http://www.ees.ac.uk/research/Oxyrhynchus%20Papyri.html>).

The Association Égyptologique Reine Élisabeth (AERE/EGKE), alongside the website with institutional information (<http://www.aere-egke.be>), offers a news blog (<http://aere-egkeinfo.skynetblogs.be>).

Also the International Association for Coptic Studies (IACS) and the International Society for Arabic Papyrology (ISAP) have their own website. The former (<http://www.cmcl.it/~iacs>) is devoted to the history and structure of the society, news, exhibitions, a survey of Coptic studies (courses and centres) worldwide with links, congresses, links of Coptic interest. The latter (<http://www.naher-osten.lmu.de/isap>) offers, among the usual practical notices, some useful resources, like the *Checklist of Arabic Documents* (with a history of the discipline; see above, § 2.4), a list of major collections holding Arabic documents, news on international conferences, a list of scholars involved in Arabic Papyrology, publications and projects of ISAP.

For Coptic studies, a special mention is deserved by the St. Shenouda the Archimandrite Coptic Society, the website of which (<http://www.stshenouda.org>) offers several useful tools like a *Manual of Coptic Studies*, a history of Coptic language, a collection of Coptic software, links to Coptic resources online.

The Friends of Herculaneum Society website (<http://www.herculaneum.ox.ac.uk>) provides also interesting material, e.g. some information about the papyri (we already mention the bibliography *Books from Herculaneum*)⁴¹⁰.

We already talked at length of the collections catalogues; most of them are related to a specific website, though there are collections that have not created an online catalogue yet. Many useful resources came also from the web pages of the papyrological research centres. In Italy, significant institutions like the Istituto Papirologico “Girolamo Vitelli” (<http://vitelli.ifnet.it>)⁴¹¹ and the Accademia Fiorentina di Papirologia e di Studi sul Mondo Antico (<http://www.accademiafiorentina.it>) at Florence, the Centro di Studi Papirologici of

the University of Salento (Lecce; <http://www.museopapirologico.eu>), the Centro Internazionale per lo Studio dei Papiri Ercolanesi “Marcello Gigante” (CISPE) at Naples (<http://www.cispe.org>), and the Chair of Papyrology at the University of Parma (<http://www.papirologia.unipr.it>) hold articulated portals, where one can find information about their institutional activity and research projects, news and events, links, as well as interesting papyrological resources. Let us mention, for instance, the online catalogue of the library of the Istituto Vitelli and of the Accademia Fiorentina; the detailed web pages of the Papyrological Museum and of the Soknopaiou Nesos Project at Lecce; the *Digital Corpus of the Greek Medical Papyri Project* at Parma (see below, § 8.7). Among other centres worldwide, we already mentioned many resources previously, so that a quick survey will suffice, without any claim for completeness, above all because web resources are extremely volatile and not only URLs do change, but the pages themselves tend to disappear, as we already noted elsewhere (§§ 3.5, 6.4)⁴¹². It is just a way to illustrate the spread of the papyrological research in the World Wi(l)d(e) Web.

Alexandria (EG)	Centre d'Études Alexandrines (CEAlex), http://www.cealex.org
Ann Arbor (MI, USA)	Papyrology Collection, https://www.lib.umich.edu/papyrology-collection
Berkeley (CA, USA)	Center for the Tebtunis Papyri, http://www.lib.berkeley.edu/libraries/bancroft-library/tebtunis-papyri
Berlin (DE)	Berliner Papyrusdatebank (BerlPap), http://ww2.smb.museum/berlpap
Bruxelles (BE)	Centre de Papyrologie et d'Épigraphie Grecque (CPEG), http://www.ulb.ac.be/philo/cpeg
Cairo (EG)	Institut français d'archéologie orientale (IFAO), http://www.ifao.egnet.net
Copenhagen (DK)	The Papyrus Carlsberg Collection, http://pcarlsberg.ku.dk
Crete (GR)	Workshop of Papyrology and Epigraphy (ERPE) ⁴¹³ , http://www.philology.uoc.gr/erpe
Duke University, Durham (NC, USA)	Duke Papyrus Archive, http://library.duke.edu/rubenstein/scriptorium/papyrus
Genève (Cologne) (CH)	Fondation Martin Bodmer, http://fondationbodmer.ch
Heidelberg (DE)	Institut für Papyrologie, http://www.uni-heidelberg.de/fakultaeten/philosophie/zaw/papy
Helsinki (FI)	Ancient Greek Written Sources ⁴¹⁴ , http://www.helsinki.fi/hum/kla/papupetra
Köln (DE)	Arbeitsstelle für Papyrologie, Epigraphik, Numismatik, http://www.uni-koeln.de/phil-fak/ifa/NRWakademie

Leiden (NL)	Papyrologisch Instituut, http://www.hum.leidenuniv.nl/papyrologisch-instituut
Liège (BE)	Centre de Documentation de Papyrologie Littéraire (CEDOPAL), http://web.philo.ulg.ac.be/cedopal
Lille (FR)	Institut de Papyrologie et d'Égyptologie de Lille, http://egyptologie.univ-lille3.fr
London (UK)	UCL Classics: Papyrology, https://www.ucl.ac.uk/classics/research/research-papyrology (sic)
Macquarie (AU)	Papyrology, http://bighistoryinstitute.org/pubstatic/research/centres_and_groups/ancient_cultures_research_centre/research/papyrology/
Milan (IT)	Centro di Papirologia "Achille Vogliano", http://www.studilefili.unimi.it/ecm/home/ricerca/centri/centro-di-papirologia-achille-vogliano
Oxford (UK)	Papyrology at Oxford, http://www.papyrology.ox.ac.uk
Oxford (UK)	The Centre for the Study of Ancient Documents (CSAD), http://www.csad.ox.ac.uk
Paris (FR)	Institut de Papyrologie de la Sorbonne, http://www.papyrologie.paris-sorbonne.fr
Philadelphia (PA, USA)	Papyri and Related Materials at the University of Pennsylvania, http://ccat.sas.upenn.edu/rak/ppenn.html
Pisa (IT)	Laboratorio di Papirologia, Università di Pisa, http://www.fileli.unipi.it/ricerca/laboratori/laboratorio-di-papirologia
Salzburg (AT)	Papyrologie, http://www.uni-salzburg.at/index.php?id=21321
Siracusa (IT)	Istituto Internazionale del Papiro / Museo Internazionale del Papiro "Corrado Basile", http://museodelpapiro.it
Strasbourg (FR)	Institut de papyrologie & Institut d'égyptologie, http://egypte.unistra.fr
Trier (DE)	Fach Papyrologie, https://www.uni-trier.de/index.php?id=1528
Trieste (IT)	Centro Papirologico "Medea Norsa", http://mnorsa.altervista.org
Wien (AT)	Institut für Alte Geschichte und Altertumskunde Papyrologie und Epigraphik, https://altegeschichte.univie.ac.at
Yale University, New Haven (CT, USA)	Yale Papyrus Collection, http://beinecke.library.yale.edu/collections/highlights/papyrus-collection-database

To be added is the portal *Organa Papyrologica* (<http://www.organapapyrologica.net>), maintained by the University of Leipzig, which is a gateway to the catalogues of the German papyrological collections participating in the *Papyrus Projekt*, to the nFWB, and to the *Papyrus Portal*, the metacatalogue of all German papyrus collections (see above, §§ 3.6 and 4.3, for everything), in search for an integration of all German papyrological resources⁴¹⁵. Moreover, as already noted above, the page *Demotic Texts Published on the World Wide Web* provides a list of institutions, collections, and projects dealing with Demotic texts⁴¹⁶.

6.2 Papyrological P.R.

The Web hosts several introductory pages, sometimes very short, that intend to offer a first overview on Papyrology. Such resources, directed mostly to non-specialists, are usually maintained by institutional websites (research centres or collections: see above, §§ 3.6 and 6.1). The most articulated is probably the already mentioned *Duke Papyrus Archive*, in the section *Information about papyri* (<http://library.duke.edu/rubenstein/scriptorium/papyrus/#papyri>), comprising six web pages about papyri, writing in Graeco-Roman Egypt (with nice pictures), late antique Egypt, a general bibliography and a bibliography on Greek literary papyri. The section includes also the famous paper *The Century of Papyrology (1892–1992)* by Peter Van Minnen (20th International Congress of Papyrology, Copenhagen 1992), here titled *History and Future of Papyrology*. A very peculiar introduction is also *Reading the Papyri*, an online didactic portal designed to give a basic course of reading some papyrus samples (<https://www.lib.umich.edu/reading>). These – two Latin and two Greek papyri, a literary and a documentary one for each language – are presented in digital pictures; users are guided from line to line, the letter shapes are automatically highlighted and compared with a transcription and a translation (see above, § 5.4). There are also extensive comments; the section about the Zenon archive looks particularly articulated.

A nice reading could be the HTML version of Marcel Hombert's 1925 lecture *La Papyrologie grecque* published by the CPEG (<http://www.ulb.ac.be/philo/cepg/hombert.html>). Some introductory readings (palaeography, papyrus material and provenance) can be found in the section *Articles of the Papyri Pages* published by Theodore Bernhardt (<http://papyri.tripod.com>; despite its title, the other parts of the site do not seem to contain strictly papyrological material). Many other pages are just short overviews and it does not make sense listing them here. Other online exhibits at Michigan have a similar introductory purpose (see below, § 6.3). The *Online Database of Papyrology* (actually a page titled *Introduction to Papyrology*, <http://home.uchicago.edu/~davidm>), created by David Martinez (Chicago), is in fact a small collection of images related to the papyrus and

some famous papyri (Timotheus, Derveni, etc.) and can be of some didactic utility.

As regards the most iconic digital dissemination tool, *Wikipedia*, just a very basic lemma *Papyrology* is currently featured⁴¹⁷. However, further information does exist, scattered here and there (for example, pages devoted to scholars or to particularly famous documents), and the future – as wished by Nadine Quenouille – may bring

das Erstellen eines Papyrologie-Portals analog zum dortigen Ägyptologie-Portal, versehen mit Informationen rund um das Fach, die im Netz vorhandenen Suchmöglichkeiten und Datenbanken, die Quellen und deren Bearbeiterinnen und Bearbeiter⁴¹⁸.

Papyrology is potentially a discipline of huge impact on the wider public, as the success of the *Ancient Lives* crowdsourcing project (see above, § 5.4) shows: the statistics by the end of 2014 spoke of 9,288,620 characters clicked and 151,087 fragments examined⁴¹⁹: “[t]his is a new, interesting medium of publicity for our field, and could be used for pedagogical purposes”⁴²⁰. Though open collaborative platforms are not new to Papyrology (see the case of SoSOL for *Papyri.info*, and other examples, below §§ 8.5–6), *Ancient Lives* is revolutionary in opening the gates to the wider public, in line with the so-called crowdsourcing (also known as citizen science)⁴²¹, in a sort of extended *amicitia papyrologorum* made necessary by the extremely huge amount of unpublished papyri still concealing potentially important texts⁴²². Its strong social impact needs to be stressed as a completely new and partially unexplored trend in Digital Papyrology⁴²³.

However, apart from isolated and scattered attempts to introduce Papyrology through practical activities on the fringes of gamification⁴²⁴, papyrological P.R. in the digital era are still an open issue and a ground to explore, with particular attention to the social media, where its presence is still scattered⁴²⁵, but also to other multimedial grounds, like dedicated *YouTube* channels or *Facebook* pages: “[t]he rise in recent years of online communities with broad adoption, such as Facebook, may point to ways of enabling digital survival by generating community interest in them”⁴²⁶.

6.3 Thematic Highlights and Online Exhibitions

If a curious user wants to go further, there is plenty of interesting web pages dedicated to specific papyrological themes. One could for example learn something about cartonnage and carbonized papyri from the Helsinki papyrological website (<http://www.helsinki.fi/hum/kla/papupetra/papyrus/cartonnage.html>), with a video by Jaakko Frösén in English and German about mummy cartonnage conservation; <http://www.helsinki.fi/hum/kla/papupetra/>

papyrus/carbonised.html); or about *Ancient Greek Music on Papyrus* at a page edited by William A. Johnson ([http:// people.duke.edu/~wj25/music%20site](http://people.duke.edu/~wj25/music%20site)) with reconstructions of the ancient sounds; or about *Kochrezepte auf Papyrus* in a video by D. Hagedorn (<http://archiv.ub.uni-heidelberg.de/volltextserver/3505>); or about the “new Sappho” papyrus at the blog “New Sappho” (<http://newsappho.wordpress.com>, being a discussion on the papyrus, but seemingly not updated after 2014) or at the PDF material published on the web page of the “Reception of Greek Literature” project (<http://www.papyrology.ox.ac.uk/Fragments>). The website of the project “Materiale Textkulturen” (Heidelberg University, <http://www.materiale-textkulturen.de>) offers interesting information and open-access publications on the research topic (“Materialität und Präsenz des Geschriebenen in non-typographischen Gesellschaften”). *Dioscorus of Aphroditō*, the ‘worst poet of Antiquity’, is the focus of the website with the same name (<http://www.byzantineegypt.com>), created by Clement A. Kühn, which offers several materials on Dioscorus and his context, and text, translation, and commentary of his poem *Cicada*. An interesting experience could be listening at the reconstructed sound of the music recorded in a papyrus from the Oslo collection (picture and soundtrack at <http://ub-fmserver.uio.no/Highlights.html>)⁴²⁷. A historical overview of Italian Juristic Papyrology is offered by M. Rolandi from the website of the Accademia Fiorentina di Papirologia (http://www.accademiafiorentina.it/?pg=cop_giuridica). These are only very fragmented samples of what the Web can offer.

A special mention is of course deserved by the papyrological virtual exhibitions, full of interesting material and accessible to everyone: for instance, *Oxyrhynchus: A City and Its Texts*, for the centennial of the Oxyrhynchus publications (documentation about Grenfell & Hunt’s excavations and about the ancient city through the texts: http://www.papyrology.ox.ac.uk/POxy/VExhibition/exhib_welcome.html); several online exhibits at the Michigan Papyrus Collection⁴²⁸ and at the Center for the Tebtunis Papyri⁴²⁹; the CEDOPAL “exposition virtuelle” about *Les livres dans le monde gréco-romain* (<http://web.philo.ulg.ac.be/cedopal/exposition-virtuelle>); the overview of the Vindolanda tablets and their context, in the dedicated website (<http://vindolanda.csad.ox.ac.uk/exhibition>). A detailed overview of the permanent exposition of the Fondation Bodmer (<http://fondationbodmer.ch/musee/exposition-permanente>) can be also of interest.

Moreover, some web resources are devoted to the memory of past papyrological researches and researchers: for example, *Egitto – gli archivi della memoria* at the Accademia Fiorentina website (http://www.accademiafiorentina.it/?pg=archivi_memoria), offering documents on past Italian excavations in Egypt such as the Evaristo Breccia archive; the pages in memory of Claire Préaux, at the CPEG (photos, biography, bibliography, the text of her first article: <http://www.ulb.ac.be/philo/cpeg/preaux.html>), and of Medea Norsa, at the “Centro Papirologico M. Norsa” of

Trieste (bibliography, literature, photos: <http://mnorsa.altervista.org>). The website of the Chair of Papyrology at the University of Parma gathers some documentation about Giuseppe Botti, the first Italian Demoticist⁴³⁰ (<http://www.papirologia.unipr.it/parma/botti.html>, in collaboration with Marco Botti), and is starting to build a page in memory of Professor Isabella Andorlini, sadly passed away few months ago (<http://www.papirologia.unipr.it/IA>).

6.4 Staying Papyrologically Digitally Tuned

Almost indispensable to navigate the digital *mare magnum* of the papyrological Internet, link reviews are unfortunately subject to a severe updating issue⁴³¹. As already noted above (§§ 3.5 and 6.1), URLs change very quickly and very often, if the page is not provided with a permanent link, and sometimes the websites themselves have quite a short digital life. Link reviews should be updated accordingly, but this is a demanding task and hardly ever has one time and patience to keep track of all the changes in the Web. I am quite sure that within one year, if the world still exists, many of the links I recorded here will be broken. Nevertheless, directories of web resources are very useful, at least for discovering what might be available online, and what to look for with the help of some good search engine.

The AIP website itself provides a section of links (<http://www.ulb.ac.be/assoc/aip/liens.htm>), arranged in some categories. Other starting points can be, e.g., J.D. Muccigrosso's *Papyrology Home Page* (<https://users.drew.edu/~jmuccigr/papyrology>), very carefully organized but updated to 2000, or the section *Fonti papiracee* of the *Rassegna degli strumenti informatici per lo studio dell'Antichità classica* edited by Alessandro Cristofori at the University of Bologna (<http://www.rassegna.unibo.it/papiri.html>), very detailed (it provides a short overview of the resources, and bibliography) but updated to 2007. Unfortunately, the Italian portal *Archaeogate*, which contained a section *Papirologia*, seems not to be working any longer⁴³²; on the contrary, KIRKE (*Katalog der Internetressourcen für die Klassische Philologie aus Berlin*) works, is updated to 2016 and has a section devoted to Papyrology (<https://www.kirke.hu-berlin.de/ressourc/buchkult.html>; but note that *Papyri.info* is completely absent and the link of APIS points to the old version on the Columbia servers, so perhaps this section is not really up to date). Also the website of the Chair of Papyrology at the University of Parma offers a links section (*Papyri On Line*: <http://www.papirologia.unipr.it/POL>), arranged by categories and updated to 2014 (but it will be refreshed soon!). Anyway, it is always a good idea to look also at more general collections of digital resources like *The Ancient World On Line* (AWOL, <http://>

ancientworldonline.blogspot.de), a blog recording all the news in the Internet for the ancient studies⁴³³. The posts are labelled, so that one can search for the label “Papyrology” (<http://ancientworldonline.blogspot.de/search/label/papyrology>) and discover the news.

Since the *amicitia papyrologorum* is essentially founded on communication, we will not be surprised by the fact that papyrologists intensively utilize the two most traditional forms of digital communication via Internet: blogs and discussion lists. We have already encountered several blogs devoted to papyrological matters, but the ultimate resource to get informed about all the news in the papyrological community is *What's New in Papyrology* (<http://papyrology.blogspot.de>)⁴³⁴, a blog regularly edited by G.W. Schwendner that since September 2006 posts news about publications, conferences, lectures, and other information of papyrological public interest. On the left of the page, an index helps browsing among the past communications, by month. Another blog is devoted to *Digital Papyrology* itself (<http://digitalpapyrology.blogspot.it>), with the purpose of publishing “news and commentary concerning digital applications, methodology and resources in papyrology” (regular updates about resources like *Papyri.info* and TM used to be posted), but its latest signs of life date back to 2012. Blogs about single researchers’ activities or about specific projects can also be found around⁴³⁵.

An even more direct way of communicating and interacting is the mailing list *Papy* (“the list for papyrologists”: <http://lists.hum.ku.dk/cgi-bin/mailman/listinfo/papy>), which since 1993 brings lots of useful messages with news, updates, requests, discussions directly to the members’ e-mail boxes. The list is hosted by the servers of the University of Copenhagen and managed/moderated by Adam Bülow-Jacobsen⁴³⁶. After subscription, the members will receive the posts (labelled “PAPY”), which can be sent by anyone to the address papy@lists.hum.ku.dk. To avoid embarrassing circumstances, it is important to remember that the replies to the messages do not go to the original sender only, but are circulated to the entire list.

6.5 Good and Bad Digital Practices: Overcoming Cultural Boundaries and Purchasing Papyri Online

The endless possibilities of digital communication can have positive outcomes on the spread of papyrological knowledge not only outside the purely academic world, but also outside traditional geopolitical barriers that have been consolidated in many decades of study tradition. Usama Gad has recently pinpointed the customary ‘Eurocentrism’ of Papyrology – a situation

that, if on one hand may be explained with the overall historical tradition of classical studies, on the other hand is absolutely paradoxical, since almost all the texts underlying papyrological studies come from Egypt⁴³⁷. Gad has well highlighted the fact that papyrological Eurocentrism mainly stems from the print culture; as a result, most people in Egypt don't believe that papyri are national history to them. The new digital possibilities of opening up data are thus a great opportunity for striving towards a breakthrough:

I wouldn't exaggerate if I told you that I would feel myself guilty if some day one of these students grow up and imitate what IS had done to the archaeological sites in Syria, because he doesn't appreciate it. Why he doesn't appreciate it? Simply because he doesn't understand what was there / what is this. And why again? because most of the sources are not accessible; either they are in reality (there in Egypt or elsewhere in the Arabic world) secured in magazines that in the near future, due to many reasons that [go] beyond this presentation, won't open even to scholars like you and me!, or it is presented online (virtually) with languages, which he doesn't understand, and filled up with pieces of information (data, metadata), which are irrelevant to him. This was the past and to somewhat the present, but do you want that this would be our shared future?⁴³⁸

The proposal is to exploit the interconnection power of the new technologies – in terms of resource linking, metadata cataloguing, translating, etc. – to address new types of audience. Such new perspectives would not harm what has been built so far, yet would substantially widen the scope of Digital Papyrology in promising development prospects, and goes in the very same direction as projects like *Ancient Lives* (see above, § 6.2).

There are also less good ways of exploiting the communication potentials of digital technologies for papyri-related purposes. The selling of papyrus fragments via *eBay*, the famous online auction and shopping website, is the most noticeable one. The issue was brought to the attention of the colleagues by Robert Kraft (University of Pennsylvania), who presented a paper on the subject at the 25th International Congress of Papyrology (Ann Arbor, 2007)⁴³⁹. Kraft investigated thoroughly to trace the buyers and put together a sort of 'archive' of such *eBay*-sold papyri, in particular collecting the pictures reconstructing some dismembered items, and discovering forgeries⁴⁴⁰ (see picture below). It is of course a remarkably borderline case, not really involving notions of Digital Papyrology; nonetheless, it is an existing way of 'dealing' with papyri in the digital era, and quite a unique example of digital dispersion (and virtual reunification!) of papyrus archives.

"Pursuing Papyri and Papyrology by Way of eBay: A Preliminary Report"

to the 25th International Congress of Papyrology, 3 August 2007 (University of Michigan, Ann Arbor) [see [Abstract](#)]

In September of 2005, art collector/dealer Bruce P. Ferrari declared bankruptcy [images of news clips] after several months of trying to keep his financial ship afloat including the gradual sale of the holdings of his Akron, Ohio (USA) store in an attempt to meet the demands of the lawsuits which he had lost.⁴⁴¹ These

The screenshot shows an eBay listing for an 'Important Large Papyrus Fragment of Greek Letter'. The item is listed by a seller named 'Vintage and the World of Mine'. The listing includes a price of \$199.99, a shipping cost of \$19.00, and a total of \$218.99. The item is described as a '14 leaves 15 lines (24-25" x 25-25" H x 1")' and is 'US First-Class Service Express Mail®'. The seller's location is 'Akron, Ohio, United States'. The listing also includes a 'Meet the seller' section with a feedback score of 100% and a 'Buy safely' section with a 14-day return policy.

6.6 Digital Publications

Under the caption ‘digital publications’ I consider both digital copies of printed publications and electronic-born publications⁴⁴¹. Out-of-copyright digital copies of paper works of papyrological relevance, mostly scanned in PDF format, either searchable or not, can be found in quite a huge number. Many 18th- or early-19th-century papyrus editions, reference works or periodical issues have been scanned by the *Google Books Library Project*⁴⁴² and are freely available through *Google Books* itself or the *Internet Archive* (<https://archive.org>). Others can be fetched via the *US Hathi Trust Digital Library* (<https://www.hathitrust.org>, accessible from the US only): very recently, for example, it has been announced that some volumes of the Michigan Papyri (notably, the *Tax Rolls from Karanis*) have been made available there. A recent initiative by the Institute for the Study of the Ancient World (New York University), the *Ancient World Digital Library* (AWDL, <http://dlib.nyu.edu/ancientworld>), is digitizing also papyrological volumes (<http://dlib.nyu.edu/ancientworld/search/?q=papyrology>). A particular case to be mentioned is that of the publications of the papyrological collection of Gießen, which have been digitized and are available as image files (*Digitalisierte Publikationen zu den Gießener Papyrussammlungen*, <http://bibd.uni-giessen.de/pub/papyruspublikationen.html>⁴⁴³).

Some books are made available for free by the publishers themselves: in such cases, the books are usually uploaded in their original PDF output, i.e. not as scans of paper volumes. These are the notable cases of the entire series published by the Oriental Institute of the University of Chicago (<https://oi.uchicago.edu/research/catalog-publications>), which include several prints of papyrological interest like the *Chicago Demotic Dictionary*, downloadable

in multiple PDFs⁴⁴⁴, as well as of the *Proceedings of the 25th International Congress of Papyrology, Ann Arbor 2007* (ed. T. Gagos, Ann Arbor 2010, <http://quod.lib.umich.edu/i/icp>). As we read in the home page of the latter:

This is the first time the Proceedings of the International Congress of Papyrology has been published primarily as an online edition. Individual articles are freely available to search, browse, and download. Additionally, the complete proceedings are available to purchase as a hardcover print on demand volume.

A big effort for publishing volumes in both paper and digital format has been made in the framework of the ERC project DIGMEDTEXT held at the University of Parma⁴⁴⁵. Other publications are found as electronic copies too, but only after subscription and payment: this is the case, for instance, with the *APF Beihefte* published by De Gruyter, with the Florentine papyrological volumes published by the Istituto Papirologico “Vitelli” via Firenze University Press, or the 12th volume of the *Berichtigungsliste* published by Brill (see above, § 4.5). See also the three volumes of the *Select Papyri* published in the Loeb Classical Library, flowed into the digital version of that series⁴⁴⁶.

Free online papyrological scholarly journals, or journals with consistent papyrological content, are also available, namely the *Bulletin of the American Society of Papyrologists* (BASP, electronically divulgated one year after print at <https://quod.lib.umich.edu/b/basp>) and the *Bulletin de l'Institut Français d'Archéologie Orientale* (BIFAO, uploaded at <http://www.ifao.egnet.net/bifao>; the articles of the last five issues are to be paid for). Both *Greek, Roman and Byzantine Studies* (GRBS) and *Tyche. Beiträge zur Alten Geschichte, Papyrologie und Epigraphik* have an OJS (Open Journal System) platform at their disposal, at <http://openpublishing.library.duke.edu/index.php/grbs> and <http://tyche-journal.at/tyche> respectively. A selection of issues of the *Zeitschrift für Papyrologie und Epigraphik* (ZPE), covering the years 1988–2000, is available for free download at <http://ifa.phil-fak.uni-koeln.de/8061.html>. A consistent amount of past issues of the *Journal of Juristic Papyrology* (JJP) have been recently digitized by the Museum of Polish History at <http://bazhum.muzhp.pl/czasopismo/181> (to date, from number 1, 1946 to number 40, 2010). In all these cases the articles can be downloaded as single PDF files, except for the BASP, which is digitized page by page as picture, HTML text and PDF (a PDF of the whole issues can be downloaded from number 42, 2005 onwards). Other periodicals are available on subscription from scholarly platforms like *JStor* (ZPE, *Aegyptus*, and again BASP⁴⁴⁷) and *ProQuest / Periodicals Archive Online* (formerly PAO: *Aegyptus* again, <http://search.proquest.com/pao/publication/1817550>), or from their publisher's website (*Archiv für Papyrusforschung* = APF from De Gruyter, *Chronique d'Égypte* = CE from Brepols, *Studi di Egittologia e Papirologia* from LibriaWeb⁴⁴⁸). It is worth noting that older issues of some journals can occasionally be found in the already mentioned repositories like

the *Internet Archive* or *Hathi Trust*. There may one find also digital copies of discontinued old periodicals or series like the Italian early-20th-century *Studi della Scuola Papirologica*, of which volume 3 is also on *JStor*: <https://www.jstor.org/journal/studscuopapi>. More and more scholars are uploading their own articles or book chapters online at *Academia.edu*, and this is another very useful resource for finding and accessing digital publications⁴⁴⁹.

Born-digital publications are rarer, but not absent from the papyrological panorama. The most remarkable case is that of the “Trismegistos Online Publications” (TOP, <http://www.trismegistos.org/top.php>), a series edited by Willy Clarysse and Mark Depauw (K.U. Leuven) and providing “freely downloadable pdf-documents with scholarly tools based upon or providing links to the Trismegistos database”, as one can read from the presentation in the home page⁴⁵⁰. Most of the volumes deal with surveys of documents⁴⁵¹ and resemble very much the data lists extracted from the *Mertens-Pack3* catalogue (see above, § 3.2), but a methodological introduction to a new digital research topic (network analysis) is announced⁴⁵². Beside the TOP series, *Trismegistos* gives space to unpublished valuable dissertations and similar material, under the “Trismegistos Online Publications Special Series” (TOPSS, same URL as TOP). The volumes⁴⁵³ are available the same way as described above; all of them bear ISBN numbers and therefore are proper digital publications. Similarly, the *Death on the Nile* project (see above, § 3.5) started publishing an online series, devoted to the theme of death in Graeco-Roman Egypt and called “Death on the Nile Online Publications” (<http://www.lineas.cchs.csic.es/death/node/15>)⁴⁵⁴. Another, very recent example to be mentioned is the proceedings volume of the conference *Altertumswissenschaften in a Digital Age: Egyptology, Papyrology and Beyond (Leipzig 2015)*, edited by M. Berti and F. Naether, which have been published directly online as a collection of PDFs and other material from the presentations (<http://nbn-resolving.de/urn:nbn:de:bsz:15-qucosa-201500>).

A peculiar instance is the first volume of the *Ostraka from Trimithis* (eds. R.S. Bagnall and G. Ruffini, New York 2012, <http://dlib.nyu.edu/awdl/isaw/amheida-iotrim-1>), which is not only published directly online, but also comes not as a PDF but as XHTML pages, with Unicode Greek texts, in remarkable contrast with print-like formats. We may regard such an outcome as a sort of bridge between traditional text editions and true ‘digital’ text editions, which are – however – more enhanced and complex entities, of which we will discuss later on (§§ 8.6 and 9). We are still in the realm of traditional editions made digital, as in the case of the Herculaneum papyri preliminarily published in the framework of the ERC project “Interactive edition and interpretation of various works by Epicurean and Stoic philosophers surviving at Herculaneum” (PHerC), conducted by Graziano Ranocchia at the Italian Consiglio Nazionale delle Ricerche – Istituto per il Lessico Intellettuale Europeo e Storia delle Idee (CNR/ILIESI) between 2009 and 2014 (<http://www.pherc.eu>). This project is producing a series of innovative open-access

PDF critical editions (<http://www.pherc.eu/publications.html>) that take advantage of the enhanced multispectral readings (see above, § 5.2) and of some peculiar typographical feature made possible by the electronic medium (e.g., the use of different colours to mark text coming from displaced fragments, the so-called ‘sovrapposti’ and ‘sottoposti’). Such publications, which will be followed by more substantial volumes, forthcoming in the new series “ILIESI Digitale / Edizioni critiche” (<http://www.iliesi.cnr.it/catalogo.php?cl=I>) are a sort of groundwork for a final, comprehensive printed volume, which will be accompanied by an interactive DVD⁴⁵⁵ (see below, § 8.6).

As regards periodicals, to date no papyrological title is published entirely and solely online. Several journals devoted to classics and ancient studies, and even digital classics, have digital-only issues, but none of them deals exclusively, or mainly, with Papyrology, if we exclude some special cases like *Papyrologica digitalia Lipsiensia*, monographic issue of *Digital Classics Online* (2.2, 2016, <https://journals.ub.uni-heidelberg.de/index.php/dco/issue/view/3036>) devoted to the digital papyrological projects at Leipzig University⁴⁵⁶. An earlier effort was attempted by Isabella Andorlini at the University of Parma. She launched a digital papyrological journal, called *Papyrotheke*, but unfortunately the project stopped at the first, experimental issue (2010)⁴⁵⁷. A series under the same name was similarly discontinued⁴⁵⁸. The project is currently being renewed by Davide Astori and myself, with an online international journal dealing in general with linguistics and cultural history, but with a strong focus on papyrological matters. The journal is called *Tra-Passato(e)Futuro* and a parallel monographic series, with some papyrological issues, is planned as well⁴⁵⁹.

A last (but definitely not least!) case to be mentioned is that of the *Berichtigungsliste der Griechischen Papyrusurkunden aus Ägypten* (BL): as noted above, *Konkordanz II* (2007) and Volume XII (2009) are available as PDF on payment from the publisher’s website (Brill). Very recently, a 13th volume has been announced as a free PDF⁴⁶⁰. This is a clear sign of an increasing attention to digital ways of publishing scholarship and to the strong advantages that electronic resources bring to the papyrological ideals of integration, sharing, and accessibility.

To conclude, digital publications are apparently not that implemented as other electronic expedients, but this is a common trend in classical and ancient studies (as well as, probably, in any other academic field), mostly due to publishing economic and legal reasons rather than to scientific trends. Copyright (but also intellectual property) issues still linger around, and the entire scenario is likely still tied to a traditional view of the digitization as a mainly safekeeping or copying affair, and not as a place where true scholarship can primarily, if not exclusively, take place. However, recently much progress has been made on this front too, and the future seems to prospect important and promising developments.

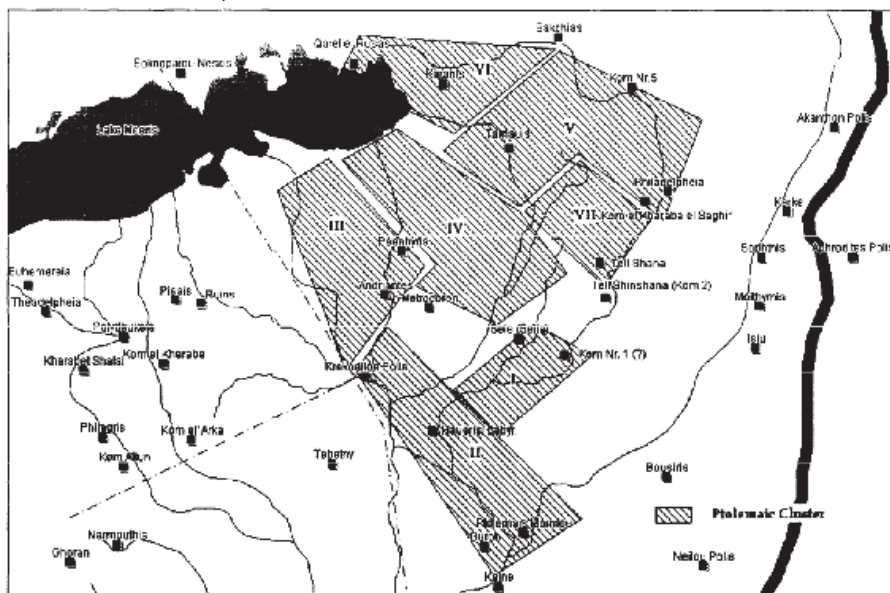

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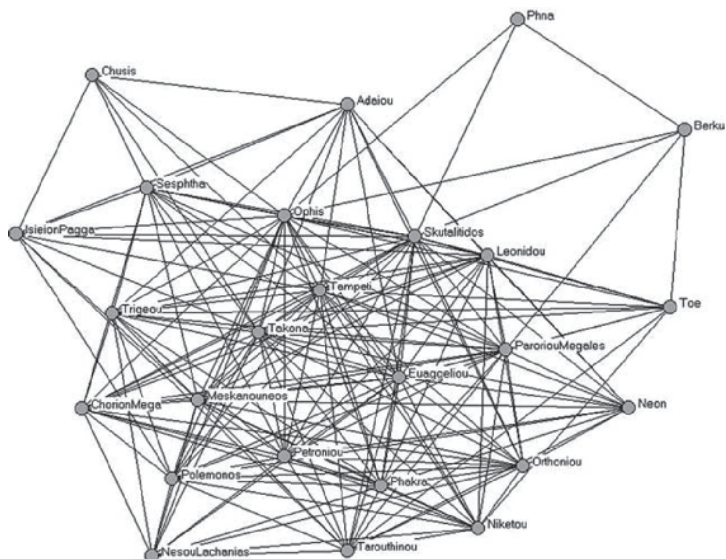
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TABLE 4. Example of one of the possible ways to export the grammatical annotations of Aristarchus in XML (the example shows the annotations for the reconstructed word [θεοῦς] from the first sentence in Phld., *Piet.*1.1, as edited by D. Obbink). The annotated features include morphology, syntax, and semantics. There is an amount of redundancy (for example, morphological categories are expressed twice) to allow exploitation by other systems. Future modes of exportation will try to meet the TEI guidelines for multilevel grammatical annotation.

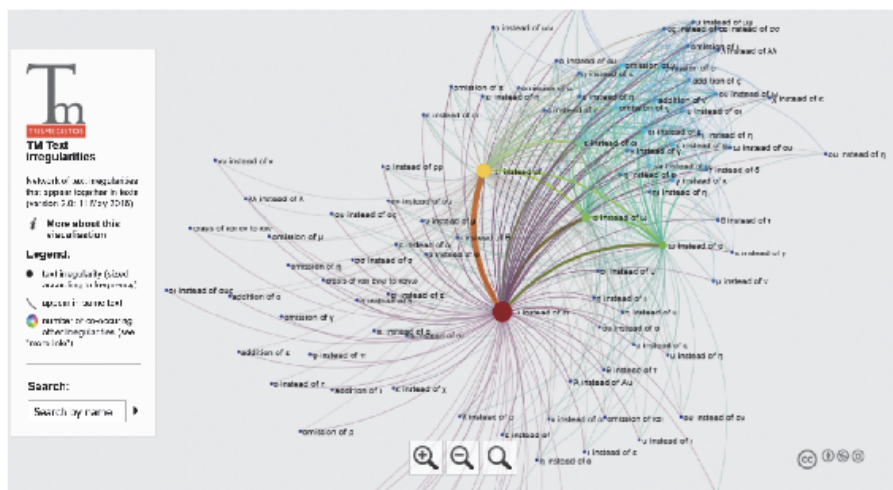
Example of grammatical annotation based on *AristarchusX* (from RIAÑO RUFILANCHAS 2014).



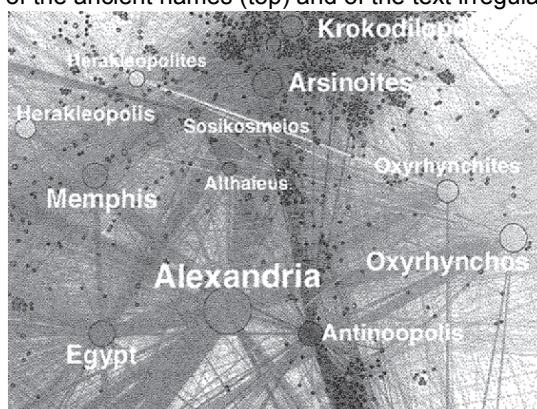
Approximate location of Ptolemaic village clusters (from MUELLER 2003b).



network from RUFFINI 2008.



Network graphs of the ancient names (top) and of the text irregularities (bottom)



recorded in TM.
network from BROUX 2016a.

A toponomastic

7 New Trends in Digital Papyrology

If you can dream it, you can do it.

Walt Disney

After the general and historical overview of what Digital Papyrology offers nowadays, and before introducing the last, crucial discussion, it is time to cast a glance at some very new, developing areas that seem to be the main topics on which Digital Papyrology is going to focus in the immediate future. As nearly all papyrologists perceive, the main issue at stake is always the enormous amount of data and metadata to be handled, in terms of both published and unpublished papyri. The unavoidable charm of digital technologies, which since half a century by now have proven essential in improving methodologies and providing invaluable scientific results, is constantly renewed by ever-developing techniques, and Papyrology is always ready to absorb and reflect as much innovation as possible.

Digital quantitative analyses seem today the best scenario for enhancing papyrological research in terms of speed and data processing, with its twofold implication – a stronger claim on quality controls, of course, but one should never forget that speed means to have more information at our disposal as soon as possible, which turns into significant progress in knowledge and research. And since the papyrologists of the 21st millennium are overwhelmed not only by data but also by the twists and turns of a maze of digital resources – which is in fact the main *raison d'être* of this book –, further steps towards integration are highly recommended, and in some cases accomplished with interesting expectations.

7.1 Quantitative Analysis of Textual Data: Past and Future of Computational Linguistics Applied to Papyrology

Applying methods and tools of computational linguistics to papyrological research is an old effort, dating back to the very dawn of the studies on natural language automated processing⁴⁶¹. As is known, in 1949 Father Roberto Busa started compiling the monumental *Index Thomisticus*, a lexical concordance to Saint Thomas of Aquinas' works, by exploiting automatic computer processing, and thus literally founded what would be called computational linguistics⁴⁶². Some ten years later, a team in Liège and one in Milan independently developed experimental systems to encode and process

papyrological texts by means of electronic calculators. Both projects were presented at the 12th International Congress of Papyrology (Ann Arbor 1968)⁴⁶³. We will deal with the issue of digital encoding in the next chapter; now I would like to stress the strong linguistic flavour of both enterprises.

Enrico Maretti and Gian Piero Zarri, on the Italian side, presented in a seminal article published in 1971 an overview of the potentials of what they called “algorithmic linguistics” to papyrological texts⁴⁶⁴. Text encoding (i.e. storing text in a machine-readable and processable format), in their view, would bring to several useful applications:

- 1) *sorting procedures* (i.e. what I called indexing), by which it would be possible to build lexica, whether natural, i.e. recording the exact forms of the occurring words, or lemmatized, i.e. reducing the occurring forms to their original lemma (typically, e.g., nominative singular for nouns) and concordances, whether sorted alphabetically or by other keys (frequency of attestation, for example);
- 2) *searching procedures*, addressed to the search for words, word sequences, and structural sequences (formulaic search);
- 3) *reconstruction* of fragmentary texts, based either on the overlapping with parallel texts or on statistical comparisons that would take into consideration the frequency of letter or word combinations to give possible supplements for the extant fragments (the authors evoke the concept of generative grammars, i.e. the automatic generation of language strings based on lexical lists and morpho-syntactic rules).

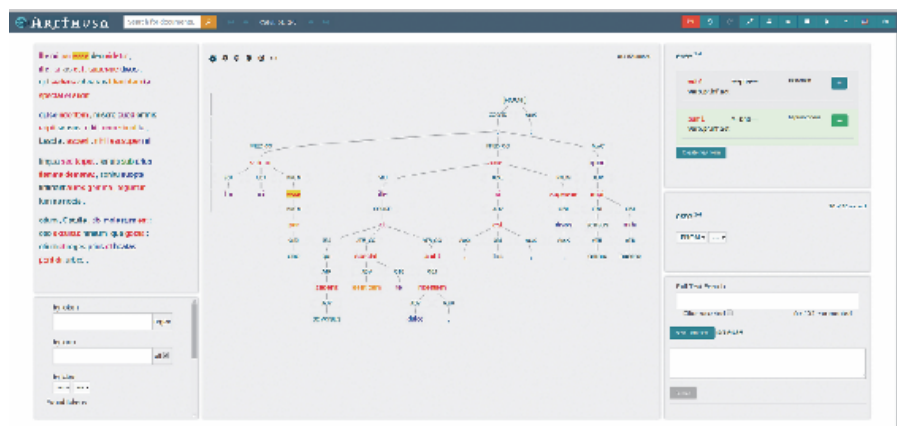
These points were shared, though less systematically, by the Belgian colleagues⁴⁶⁵, who also added a further possible application:

- 4) *edition output*, which would be conceivable in terms of basic edition (i.e. the reproduction of the reference critical edition), diplomatic edition (reproducing the actual text on the papyrus, without editorial interventions), and emended edition⁴⁶⁶.

What is interesting is that the Belgian project already envisaged very advanced linguistic features. They encoded the text by using a single punched card (see above, § 4.4) for each word (a rudimental sort of tokenization), to which they added its lemmatized form, a code representing its grammatical aspect, and a semantic code⁴⁶⁷. This would bring to different possible indexing outputs (by alphabetic lemmas, by categories...) and to morpho-syntactic and formulaic searches, but also to grammatical studies⁴⁶⁸. Unfortunately, such linguistic features remained essentially unexploited in the subsequent years: the papyrologists’ attention was captured by other, more familiar ways of dealing with digital texts, namely string searching options and text reconstruction⁴⁶⁹. The *Duke Databank of Documentary Papyri* did not encode morpho-syntactic or semantic information alongside the texts, and it was only thanks to external processing tools (like the *Word Study Tool* of the *Perseus Digital Library*⁴⁷⁰) that it became possible to access (but not to

process, or search for) such kind of information. The transfer to the *Papyri.info* platform completely obliterated this opportunity (just lemmatized searches are available, see below § 8.4).

In the meantime, corpus linguistics had developed as an autonomous discipline branch consisting in the analysis of natural languages on the basis of computerized text *corpora*. A fundamental procedure in encoding a text *corpus* so that it can be subject to significant automated linguistic analyses is annotation, i.e. the tagging of the text items (essentially the words, usually known as tokens i.e. minimal language units) with relevant linguistic information (usually morphologic, syntactic, semantic information)⁴⁷¹. It is apparent that what the Belgian researchers at LASLA did with the punched cards was a rudimentary linguistic annotation. Today, linguistic annotation is rather advanced in classical studies. *The Ancient Greek and Latin Dependency Treebank* (AGLDT, now 2.0: https://perseusdl.github.io/treebank_data), developed since 2006 by Giuseppe G.A. Celano, Greg Crane, Bridget Almas, and others, at the Leipzig and Tufts Universities, is a huge *corpus* of ancient Greek and Latin literary works, annotated on the morphological, syntactic, and ‘semantic’ layers⁴⁷². This is usually called ‘treebank’ after the typical tree-like format that a syntactic dependency graphically displays⁴⁷³. The actual annotation is conducted on the *Arethusa* platform (<http://www.perseids.org/tools/arethusa/app/#>; see picture in the next page), a computer-guided environment that allows performing the task on the three said levels: morphology (partially guided by the system), syntax (by assigning a grammatical relational label to each node of a syntactic tree), advanced syntax (semantic value of morpho-syntactic categories)⁴⁷⁴.



Linguistic annotation has been progressively conceived for non-classical texts⁴⁷⁵, and for the papyri too, in consideration of the enormous help that such kind of analysis could offer to grammatical and stylistic studies on documentary and literary fragments⁴⁷⁶. The literary side has been unfolded by the *Grammatically Annotated Philodemus* project, conducted by Daniel Riaño Rufilanchas (Universidad Autónoma de Madrid) and Holger Essler

(Würzburg) and aimed at deeply annotating the Greek philosophical papyri from Herculanum on morphological, grammatical, semantic, stylistic layers, in close connection with the *Thesaurus Herculanensium Voluminum*⁴⁷⁷. Riaño's work, based on his own proprietary software *AristarchusX* and on a personalized annotation system⁴⁷⁸, has pointed out some critical issues of annotating papyri. Namely, the fragmentation of the texts makes tokenization problematic for broken or illegible words, and makes morpho-syntactic analysis difficult for the lost passages. Moreover, alternative readings or supplements should be considered, as well as a thorough distinction of the degree of certainty of the annotated text)⁴⁷⁹.

The problem of dealing with fragmentary texts makes *Papyri.info* somewhat unsuitable for applying linguistic annotation, because sometimes the TEI/EpiDoc XML tagging system in use is conflicting with linguistic tagging (in particular, with the necessary tokenization of words)⁴⁸⁰. This issue has been faced by the *Sematia* platform (<https://sematia.hum.helsinki.fi>), developed by Marja Vierros and Erik Henriksson at the University of Helsinki. *Sematia* is an open online environment for creating linguistic layers from TEI/EpiDoc XML documents, as well as a repository for linguistic annotations of the layers. The platform is based on the very same collaborative model as *Papyri.info* (see below, § 8.5): anyone interested in collaborating can register and log in. Basically, once one logs in, (s)he can import any text from the papyrological databank, which will be automatically adapted to linguistic annotation and split into three layers (see picture in the next page): “original” (the text as preserved on the papyrus, with unresolved abbreviations, unsupplemented gaps, non-regularized spelling variants), “standard” (the text as interpreted by the modern editor), “variation”. It must be noted that the first two layers patently correspond to the concepts of “diplomatic edition” and “emended edition” as formulated by Evrard and Tomsin in the late Sixties⁴⁸¹. Then, each layer can be exported from *Sematia* to the *Arethusa* platform, annotated there, and finally brought back to be stored in *Sematia* ⁴⁸². It is clear that this information is essential to trace any kind of quantitative analysis of linguistic patterns, so that the tools offered by *Sematia* are really impressive. About a hundred annotated texts are currently stored in the repository, and a way of querying the treebanks has recently been implemented in beta version⁴⁸³.

arranged by frequency of attestation, but it is possible also to perform field-specific searches. A particular stress is put onto the phonetic context of the variations, by the indication of the preceding and following letters⁴⁸⁸.

Another opportunity that has been envisaged since the beginnings for the computerized treatment of papyrological documents is text mining, i.e. the automated extraction of high-quality information from the analysis of text patterns and trends. The ‘text reconstruction’ task theoretically envisaged by Maretti and Zarri as a peculiar feature of the automated processing of papyrological texts, based on the overlapping or the statistical comparison with parallel texts and/or on advanced analysis of generative grammars, already went in this direction. A specific software routine was later developed by Knut Kleve, the creator of *Literalogy* (see above, § 5.4), and called *Lacunology*. The term pointed precisely to the definition of a computer method of filling in gaps (lacunas) in papyrus texts. The routine was based on the comparison between any extant letters before and after the lacuna and the evaluated length of the gap with all the possible fitting alternatives, taken from a textual repository⁴⁸⁹, and substantially different from *Literalogy* and the other projects involving the graphical comparison of letter shapes. As Kleve stated, at those times the amount of digitized papyrological (and not only!) texts was insufficient to perform sensible actions⁴⁹⁰. The situation changed soon after, but – as we noted – papyrologists became interested in other applications of databanks, and any textual analysis remained based on manual comparisons after automated searches for words or combinations of words (‘information retrieval’) and indexing. However, admittedly “[a] manual search on a corpus is not sufficient for giving answers to more complex research questions”⁴⁹¹.

Text mining in Papyrology is now again in the spotlight thanks to the project eAQUA (*Extraktion von strukturiertem Wissen aus Antiken Quellen für die Altertumswissenschaft*, <http://www.eaqua.net>), conducted at the University of Leipzig between 2008 and 2013 to develop algorithmic methods for the evaluation of ancient Greek and Latin texts⁴⁹². A specific sub-project, led by Reinhold Scholl, dealt with papyri. The tools offered by the platform allow performing quantitative searches on digital text *corpora* like categorization (classification of the text according to standard topical categories on the basis of recurring keywords), co-occurrence analysis (relationships between a word and the surrounding ones), and text recognition, a sort of advanced *Lacunology*, in which a partially missing or misspelled word is compared with the textual corpus and a list of possible candidates is generated automatically⁴⁹³. For the second task, one should go to the “Demonstration Kookkurrenz-Analyse” under the “Tools” menu; it is sufficient to select the target *corpus* (the papyrological *corpus*, based on the *Duke Databank on Papyri.info*, is called “Epiduke”) and type the word. The words need to be typed in Betacode (see below, § 8.3); a virtual keyboard is available in the page, and the platform offers also a useful online converter

the work of searching for relevant words or phrases has been partially automatized, with a remarkable gain in terms of time and (very often) accuracy. The enthusiastic announcement made by William Willis, the father of the *Duke Databank*, at the 17th International Congress of Papyrology (Naples 1983), of the identification of 200 small papyrus scraps kept at Duke University (joining some other fragments at Köln) with portions of Achilles Tatius' *Leucippe and Clitophon*, book III⁴⁹⁵, came some ten years after a seminal article by S. Michaelson, I.A. Moir and A.Q. Morton (Computer Science Department, Edinburgh), who in 1975 described the experimental recognition of some fragments of the Dead Sea Scrolls with the use of an electronic calculator, concluding that "the computer can indeed excel the human being at searching for small fragments"⁴⁹⁶.

The progress is evident: in the Eighties, a papyrologist was completely able to perform such tasks, while earlier only computer scientists were: the three cited authors concluded the article with: "Any scholar who would wish to use the service of having the New Testament or LXX searched for sites is invited to write to the authors"⁴⁹⁷. This was also thanks to a new machine called *Ibycus* (see below, § 8.3), which Willis used to search for the letter sequences occurring on the fragments within the currently available TLG database: the computer displayed the results, and then he used special editing functions to reproduce the papyrus wording layout in the TLG text, which was re-aligned accordingly and shaped in the form of the lost roll. A further peculiar function let him display a diplomatic transcription of the fragments, to supplement text and recognize possible variants⁴⁹⁸. This remained essentially the standard digital way of matching literary fragments, though slightly transformed by the rise of the searching software and then of the Internet (see below, § 8.3).

It is what M. Levison defined "the scanning method" as opposed to the "concordance" and "partial concordance" methods (the comparison between words, or letter sequences, with word indexes)⁴⁹⁹, which resembles very much Kleve's *Lacunology*. The most relevant issue in the "scanning" method is that the papyrus fragments to identify are mostly written in *scriptio continua*, so that a preliminary word division should be done in order to perform searches in textual databanks that store 'normalized' (tokenized) texts with separated words; another issue is the fragmentation of the papyrus text, in that missing characters sometimes can impede the recognition.

Very recently, a joint team from Oxford, the Middle Tennessee State University and the University of Minnesota tested a revolutionary method to match papyrus fragments with known texts regardless of the wording issue. They noticed that a similar requirement does already exist in Biology, where fragmentary sequences of genes are to be matched with the full sequence, which is represented with a continuous train of letters representing amino acids. This operation is performed with a genetic sequence alignment algorithm, which sometimes leaves gaps in the alignment: a circumstance that

is certainly comparable to the condition of papyrus fragments. The researchers have therefore developed a modified version of a common genetic sequence alignment algorithm named BLAST (*Basic Local Alignment Search Tool*) creating a variant called Greek-BLAST. This basically “[f]inds regions of local similarity between sequences and compares them to databases”, and “[c]alculates the statistical significance of matches”⁵⁰⁰. The method was tested on simulated fragments and proved quite accurate; therefore, it will be further developed, and it will speed up very much the identification of the numerous new Oxyrhynchus fragments transcribed in the framework of the *Ancient Lives* project (see above, § 5.4), which was, in fact, the original reason for the development of such a revolutionary method⁵⁰¹.

```
Score = 68.4 bits (154), Expect = 8e-13
Ancient Lives fragment: 131383
FRAGMENT ΠΑ?ΑΑΟ?Ι?ΑΓΑΘΗΚΑΙΠΑΝΑΟΡΗΜΑΕΙΤΟΝΑΝΘΩΕΝΕ?ΤΙΝΚΑΤΑΒΑ
TEXT ΠΑΣΑΔΟΣΙΣΑΓΑΘΗΚΑΙΠΑΝΑΟΡΗΜΑΕΙΤΟΝΑΝΘΩΕΝΕΣΤΙ-ΚΑΤΑΒΑ
SIMILAR ΠΑ ΑΔΘ Ι ΑΓΑΘΗΚΑΙΠΑΝΑΟΡΗΜΑΕΙΤΟΝΑΝΘΩΕΝΕ ΤΙ ΚΑΤΑΒΑ

FRAGMENT ΙΝΟΝΑΠΟΤΟΥΠΑΤΡΘ?ΤΟΝΘΩΤΩΝ
TEXT ΙΝΟΝΑΠΟΤΟΥΠΑΤΡΟΣΤΟΝΘΩΤΩΝ
SIMILAR ΙΝΟΝΑΠΟΤΟΥΠΑΤΡΘ ΤΟΝΘΩΤΩΝ
```

To conclude, it is important to recall a fundamental *caveat*, which should be born in mind by anyone dealing with quantitative methods to analyse ancient texts. As pointed out by Massimo Magnani some years ago in a set of striking philological considerations⁵⁰², problems of textual interpretation and constitution make ancient writings a complex and stratified matter, which quantitative analysis very often tends to smooth and flatten, equalizing the data. Only the scholars’ skills can therefore give the correct interpretation to what is processed by the machine.

7.2 Quantitative Analysis of Metadata: Social Network Analysis in Papyrology

Quantitative analysis of papyrological metadata has a flourishing recent tradition focused on the *Trismegistos* portal, where it is possible not only to search for information, but also to generate a wide range of statistical results, often displayed as graphs and charts that help visualizing chronological, geographical, and thematic distributions, with particular regards to personal names (see above, § 3.3). Very recently, this task has been enhanced thanks to the development of Social Network Analysis (SNA), an automated method for representing and measuring structural forms of relation and interaction between entities, originally developed – between the late Fifties and the early

Seventies – by Mathematics, Anthropology, Sociology and recently spread – thanks to the application of computer technologies⁵⁰³ – also to other research fields, including Ancient History⁵⁰⁴.

Network analysis has been introduced in Papyrology in the early 2000s. Since it consists essentially in reproducing the correlations between entities by arranging them in a space through graphs (information visualization by means of relational maps), Katja Mueller applied such quantitative methods – namely, the algorithms known as MultiDimensional Scaling (MDS) and Monte Carlo simulations (MCS)⁵⁰⁵ – to locate possible Ptolemaic Fayum settlements on the basis of the topographical data stored in the relational geographical database GEOREF of the *Prosopographia Ptolemaica Online*⁵⁰⁶. The baseline assumption is that the degree of social interaction between a couple of settlements is proportional to their geographical link, i.e. settlements occurring together in the same texts could have been geographically close to each other. A subsequent article published by a mathematician and a computer scientist posed some caveats to this method, which is not seen as unreliable *tout court*, but subject to some technical pitfalls (the selection of the source data, the methodology of analysis, the reduction of complex facts to mathematical procedures) that must be taken into consideration to check, adjust, and refine the results⁵⁰⁷. Mueller herself, at any rate, had warned that “MDS should not be used as the sole method”, though it can provide some tentative, approximate clues⁵⁰⁸. Not many years later, Giovanni Ruffini retained the said assumption (co-occurrence as a clue to neighbourhood), applying it to Byzantine Oxyrhynchites⁵⁰⁹, and thoroughly utilized topographical network analysis to determine the relative location (but not the absolute topography⁵¹⁰!) of the settlements belonging to the Apions’ estate⁵¹¹.

Ruffini subsequently turned from topographical networks to a more general use of quantitative analysis of papyrological data to sketch the social pictures of Byzantine Oxyrhynchus and Aphrodito and to explore the differences between them⁵¹². In this view, papyri are considered as social events connecting people to each other; a social connection is given by the joint involvement of people in the same papyrological event. The author extracted the relevant information from topographical and prosopographical registers⁵¹³, which index the papyrological occurrences of places and people, and processed it with UCINET, a software designed to analyse and plot (with the embedded program *NetDraw*) social network data⁵¹⁴. The program draws a grid listing the connection between each entry and all the others, in terms of binary digits (1 = existing connection, 0 = non-existing connection). Some potentially distorting facts are taken into consideration and removed accordingly⁵¹⁵.

A network is visualized through graphs, where points (called nodes) represent any piece of data, and the connecting lines (edges) are the relations

between the entities. The network graphs coming from papyrological data are usually of the type called ‘two-mode graphs’ since they connect different types of data (people, places, and papyri; a one-mode network, e.g., represents connections between people only), but can be reduced to one-mode graphs by affiliation analysis, so that if two people appear in the same text, then there is a connection (affiliation) between them. The network parameters like density (the probability that any node is connected to any other one), centrality (the less nodes with most links, or shortest paths to all other nodes, or staying on the most paths between nodes, the more the network is centralized, i.e. hierarchical), distance (number of steps between two nodes, i.e. social interconnectivity), degree (average number of relations between each node, or absolute number of relations of a single node), structural equivalence (nodes that have the same relations with all other nodes), cliques (subsets of “nodes, all adjacent to each other, with no other nodes adjacent to all the clique members”⁵¹⁶), clusters (subsets of nodes “that have a higher personal degree with other set members than with non-members”⁵¹⁷), cohesion (minimum number of nodes to be removed to fragment the network; these nodes are called cutpoints) help analysing the social interactions between nodes⁵¹⁸.

As recalled above, the *Trismegistos* databases prove powerful in the quantitative analysis of papyrological metadata (we mentioned many publications that rely on the analysis of the data provided by TM), and their relational architecture already provides basic connections between texts, people (individuals and names), and places (see above, § 3.3). The potentials of SNA applied to TM data have been recently explored by Yanne Broux and Silke Vanbeselaere (who also run a blog devoted to network analysis, *Historical Dataninjas*, <http://historicaldataninjas.com> – formerly *Six Degrees of Spaghetti Monsters*), and now each entry of *TM People* (NAM) shows a coloured graph visualizing the genealogical connections of the name in question. Moreover, a section specifically titled *TM Networks* (<http://www.trismegistos.org/network>) offers, alongside a general overview of networks, a set of searchable network graphs based on the relational TM data about modern authors (from *TM Editors*, BP, and DL), ancient names, and text irregularities (<http://www.trismegistos.org/network/databases>). In the TM network graphs, each node’s size and colour are usually related to its degree, i.e. the number of relations with other nodes: small and ‘cold’ (black/blue) dots are nodes with few relations, big and ‘hot’ (up to red) dots are nodes with many relations; nodes can also be coloured according to categories (for example, types of languages). *TM Networks* also offers a tool to convert two-mode networks to one-mode, for those who dare analysing networks on their own: TOMATOR (*Trismegistos One-Mode Generator*, <http://www.trismegistos.org/network/tomator>); and a tutorial is available from the abovementioned blog⁵¹⁹. Things are now a bit easier than ten years ago: basically, lists of names obtained from TM can be exported and converted into

spreadsheets and subsequently CSV (*Comma-Separated Values*) lists that can be automatically processed by programs like the said UCINET or open-source Gephi (<https://gephi.org>).

Moreover, the section *Networks for articles* (<http://www.trismegistos.org/network/articles>) provides the graphs of the articles published by the TM members on the basis of SNA conducted on several different topics. TM network analysis has been first and foremost directed towards onomastics, for the study of naming patterns, practices, and changes as social indicators, according to the specific interests of the involved scholars and the long-standing tradition at Leuven, which had led – just to mention its digital outcome – to the *Prosopographia Ptolemaica Online* and later to *TM People*⁵²⁰.



geographical interrelations and hypothetical approximate placements for unknown sites⁵²⁴.

A further implementation of the method is the analysis of epistolary framework, dealt with mainly by Nico Dogaer with a focus on Demotic letters from Elephantine: the people and places and the formulas are analysed by means of two-mode networks to map and study personal interactions, geographical communications, and epistolary patterns⁵²⁵.

The expansion of TM to texts beyond papyri (see above, § 3.3) now makes it possible to think in great style: extending NER and SNA methods to Latin texts and to inscriptions could lead to a large-scale analysis of naming patterns as connected to social practices from across the entire ancient Mediterranean, with a particular focus on the Romanization of the provinces.

Eventually, the goal of Trismegistos is to recreate a prosopography of the Graeco-Roman world. Reconstructing social networks of the past will help us gain a better understanding of the mechanisms of interaction in the ancient Mediterranean, not only on the micro level (individuals), but also on the mesa (communities) and even macro (regions, empires) levels. At the same time connections and communications across these different levels can be analysed: how individuals, as members of local communities, were integrated into larger political structures [...], and how these communities responded to impositions from above [...]. Social models, such as the six degrees of separation theory, can be tested, to check whether our ‘small world’ perception is indeed the result of present-day technology and mass-communication, or if similar structures of interconnectivity existed, and, if so, what the conditions for this ancient globalization were back then⁵²⁶.

Of course, this goes far beyond Digital Papyrology, since it envisages “a universal Facebook of the Ancient World”⁵²⁷ – but is a nice example of how Digital Papyrology, always in the forefront, can prove pathbreaking in adopting new research methodologies and spreading the word beyond its own disciplinary borders. On the other hand, as happens with any other statistical/quantitative data analysis applied to papyrological sources, one must be aware of the risks of extracting generalizing patterns and trends from a dataset which is by nature essentially partial and chance-based. While operating on small, homogeneous groups of documents (like some archives, for example) can provide significant results, wider considerations should be treated with extreme carefulness⁵²⁸: “brute computer force can hardly be the one and only way to success”⁵²⁹.

7.3 Integrated Scholarly Workspaces



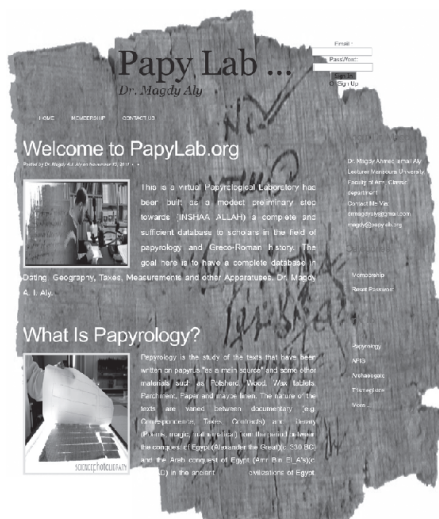
Collaboration, as we saw several times, is a primary trend in Digital Papyrology, and the openness of the digital tools is a crucial progress along this path. The SoSOL platform of *Papyri.info* (see further on, § 8.5) has been a pioneer in developing the concept of online collaboration, especially in the field of Digital Papyrology, but the very claim that papyrological resources should be open to the entire papyrological community and not managed by small research teams is itself not new: in 2001, while reviewing the first release of LDAB on CD-ROM, Nick Gonis wished that future releases “should allow the user to interact with the database, to intervene in the way one would do in the margins of a printed book”⁵³⁰. The more the information technologies develop, the more digitized data grows, and the need for constant update and correctness makes the work of small teams heavy. Since June 2016, a papyrological version of Uncle Sam pops out of the TM portal, announcing: “We want you for Trismegistos: do not ask what TM can do for you, but what YOU can do for TM!”⁵³¹.

The exhortation, here, is to advise about possible mistakes or shortcomings, but the need for a larger participation to maintain huge repositories of data is undeniable. The more recent platforms for linguistic annotation and data mining on papyri (*Sematia*, eAQUA) are open to anyone willing to contribute, under the necessary control⁵³². These implementations have a double positive effect: they efficiently increase the amount of data and metadata stored in the online repositories, and at the same time provide the scholars with open environments for advanced research.

The latter objective – to develop digital environments that could facilitate the scholarly work as much as possible – is the purpose of some recent projects aiming at collecting resources and tools all together, so that the researcher does not waste his time, nor gets lost in the labyrinth of the ever-growing digital facilities. The *Integrating Digital Papyrology* project has been pathbreaking in this direction, and I will deal with it later on (§ 8.4). Since we are now interested in the newest trends of Digital Papyrology, a particular mention is deserved by the concept behind the *PapyLab* online utility planned by the Egyptian colleague Magdy Aly in 2012/13 (<http://papylab.org>). This was intended to collect in a “virtual papyrological laboratory” a set of utilities

for the papyrological research work: reference tools e.g. for dating, geography, taxes, measurements were planned. To date, the website is unavailable, but the concept behind it recalls a somehow old *desideratum*, expressed by Roger Bagnall already in 1998:

There will be some other work needed to give maximum utility to APIS's front-end software. For example, it would be helpful, especially to the nonpapyrologists, to incorporate into it a handy program developed by the Belgian scholar Willy Clarysse that converts the dates in the papyri into Julian form. For example, if you came across a text dated to the sixteenth regnal year of Antoninus Pius, the month of Pachon, and the third day, probably only five people in the world could tell you without looking it up that this was A.D. April 28, 153. With Clarysse's converter, you would simply pull up a window into which you would type the emperor, the year, the month, and the day, and up would come the answer. Over time, of course, it is easy to imagine other such tools that would be handy. For starters, how about incorporating digitized versions of the maps of Egypt being prepared for the Atlas of the Greek and Roman World? Then you could type a place-name encountered in the papyrus into the pulldown dialogue box and have a map of Egypt pop up showing where it is. This dream will take a little longer; but it is realizable⁵³³.



Bagnall's dream is almost accomplished, and in a more efficient scenario: the geographical utility (I am of course thinking of *TM Places*: see above, § 3.3) is now a scholarly tool that helps contextualizing the texts and hopefully studying spatial patterns. Clarysse's calendar itself (a Mac-compatible *HyperCard* shareware application called *DateConverter*⁵³⁴) evolved into a resource integrated in the *Trismegistos* portal: *TM Calendar* (<http://www.trismegistos.org/calendar>), a relational database connected to the TM framework (see above, § 3.3), which is able to convert Ptolemaic and Roman regnal years, indiction years, Diocletian era years, and consular years into Julian dates, providing also links to documents dated (exactly or loosely) to the period searched for. From the left-hand menu it is also possible to browse lists of periods, dynasties, rulers, years, centuries, and even new moons. The

date range covered by *TM Calendar* is 3000 BC to AD 1000 (regnal years: 746 BC – AD 641). The integration with the textual metadata makes this calendrical utility different than other similar resources available online, where one could find some interesting features anyway: Chris Bennett's *Chronological Tables* (<http://www.tyndalehouse.com/Egypt/ptolemies/chron/chronology.htm>) are a set of *Excel*/HTML/CSV tables displaying the Julian correspondent for dates in the Egyptian and Roman chronological systems, but also in the Babylonian, Macedonian (missing⁵³⁵), Olympic, and Athenian (missing) systems, which are not considered by *TM Calendar* for now (note that Clarysse's software supported a wider range of chronologies: *ab Urbe condita*, era of the martyrs, era of Oxyrhynchus, Olympiads). *Excel* files are available also for consular years and Egyptian lunar cycle (below in the page); for each system is also provided an introductory discussion. It must be noted that the chronological tables belong to a website devoted to the Ptolemaic dynasty (<http://www.tyndalehouse.com/Egypt/ptolemies/ptolemies.htm>), with also introductory sections and useful genealogies. The *Date Converter for Ancient Egypt*, developed by Frank Grieshaber (Seminar für Alte Geschichte und Epigraphik, Universität Heidelberg; <http://aegyptologie.online-reourcen.de>), provides a search engine for the dates of the late Pharaonic, Ptolemaic and Roman periods, in this case via drop-down menus and number selectors for days and years.

Prof. Konverter 1.2

neue Anfrage Wandeljahr -> julian.

professional dateconverter

Roman chronology

day: 13 month: thot year: 12 King/Emperor: Augustus

calculate

day of the week

Tag: 10 Monat: september Jahr: 019 before Christ

change chronology

quit

It is apparent that a more extended integration of such calendrical utilities, not only in the metadata catalogues but also in the textual databanks, would be of great benefit for the researchers. And why not implementing (as planned by M. Aly) similar help tools for the easy and quick reference of tax rates, units of measure, currencies, etc., which would be of great usefulness during research? Eventually, an integrated scholarly workspace that could provide the papyrologists with the most possible work tools at their fingertips is not that

science-fiction. A project developed between 2005 and 2009 at the University of Oxford under the guidance of Alan Bowman and colleagues explored the possibility of building a *Virtual Workspace for the Study of Ancient Documents* (VWSAD) as a Virtual Research Environment (VRE) that could provide direct and integrated access to dispersed resources such as images, lexica, text *corpora*, etc., with cross-search and advanced editing options, a virtual workspace to process research data, and applications favouring collaboration among scholars. Admittedly inspired by the integrating papyrological projects such as APIS, the *Duke Databank*, and the *Vindolanda Tablets Online* (see below, § 8.6), the experimental prototype was directed to the decipherment and textual analysis of damaged and degraded ancient documents (papyri, writing-tablets, and inscriptions), with a strong focus on the archaeological materiality of the written objects, and directly linked to the Oxford developments in reading Roman tablets by means of digital techniques⁵³⁶. A somewhat similar workspace, again developed at Oxford and called *Perseus*, will be discussed later on (§§ 8.6–7).

Date Converter for Ancient Egypt

[Home](#)[Convert...](#)[REST API Documentation](#)[About](#)[Contact](#)

Roman Emperors

The system expects that the user knows what (s)he's doing: ahistoric entries will result in mathematically correct but otherwise rather useless dates.
Not specifying a day will result in calculation of both the first and last day of the given month.

reign:

Augustus, years 1-43

year:

month:

Thoth = Achet I

day:

convert date

reset

USASCII code chart

	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	C	E	P	A	E
1	SOM	DCI	I	A	Q	E	Q	
2	SYN	DC2	*	E	R	E	Q	
3	ETX	DC3	#	C	S	E	Q	
4	END	DC4	I	A	Q	T	E	Q
5	ENG	NAK	%	E	U	E	Q	
6	ACK	SYN	B	E	F	V	E	Q
7	BEL	ETB	'	9	E	W	E	Q
8	BS	CAN	I	B	H	X	E	Q
9	HT	EM	1	9	I	V	E	Q
10	LF	SUB	#	:	J	Z	E	Q
11	VT	ESC	*	:	K	E	Q	
12	FF	PS	-	<	L	E	Q	
13	CR	GS	-	-	M	E	Q	
14	SO	RS	-	>	N	E	Q	
15	SI	US	/	7	O	E	Q	

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0																																
1																																
2																																
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10																																
11																																
12																																
13																																
14																																
15																																

7-bit ASCII chart & SuperGreek ASCII chart.

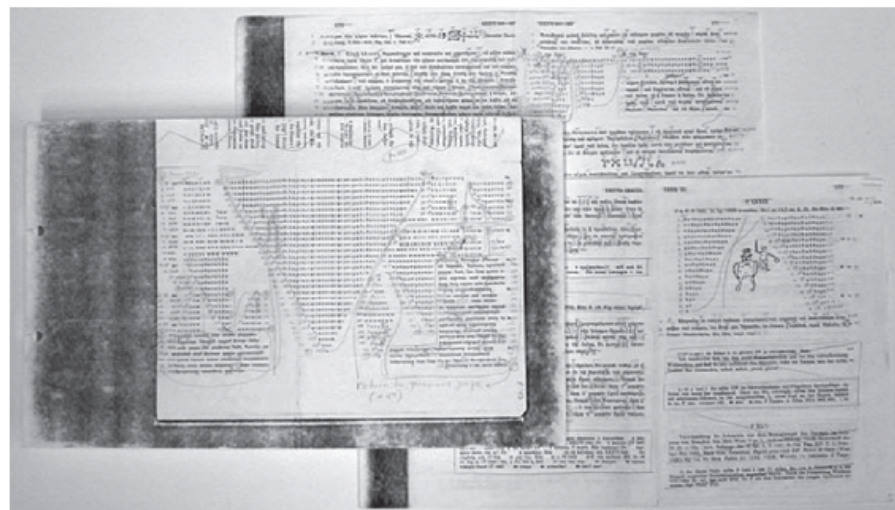
Tipo di carattere: New Athena Unicode

Δ	Λ	Η	Τ	Ι	Δ	Α	Κ	Ε	Ο	Ρ	Υ	Υ	Υ	Ε	Ε
Σ	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω
Η	Ι	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ

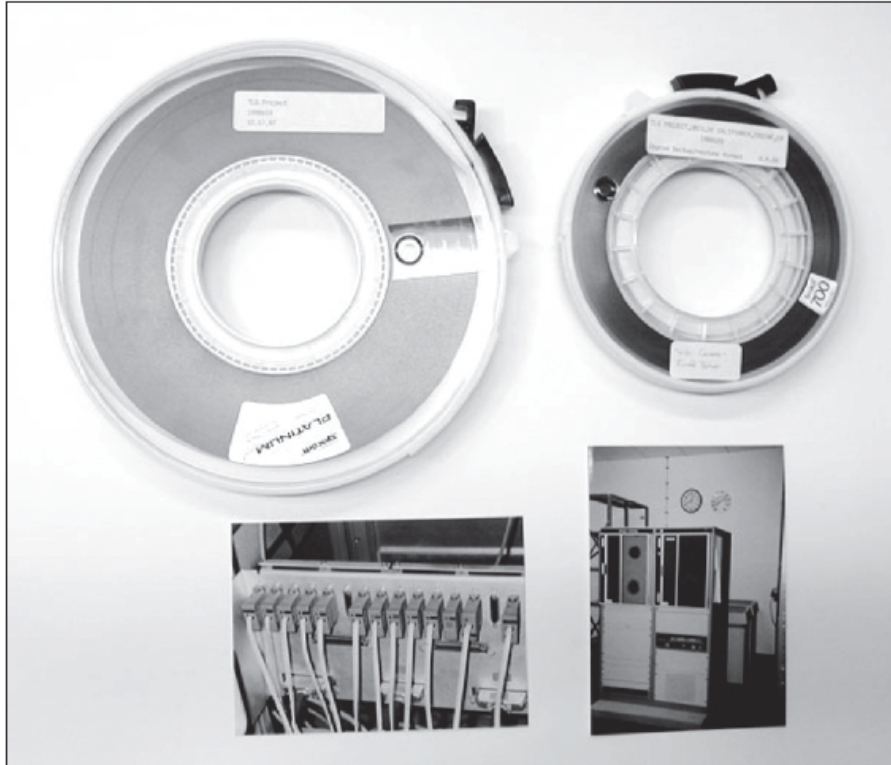
Tipo di carattere: IFAO Grec Unicode

Δ	Λ	Η	Τ	Ι	Δ	Α	Κ	Ε	Ο	Ρ	Υ	Υ	Υ	Ε	Ε
Σ	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε	Ε
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι	Ι
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω	Ω
Η	Ι	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ	Υ

Private User Areas of New Athena Unicode and IFAO Grec Unicode (part).

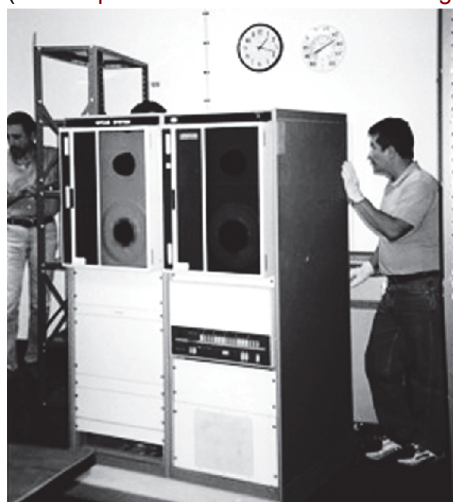


From the UCI Library website (http://lib.uci.edu/sites/all/exhibits/tlg/index.php?page=section_6): "Sample pages from a published edition of a Greek text marked up and ready for data entry". The text is remarkably a magical papyrus.



Magnetic tapes and the *Ibycus* System

(from http://lib.uci.edu/sites/all/exhibits/tlg/index.php?page=section_7).

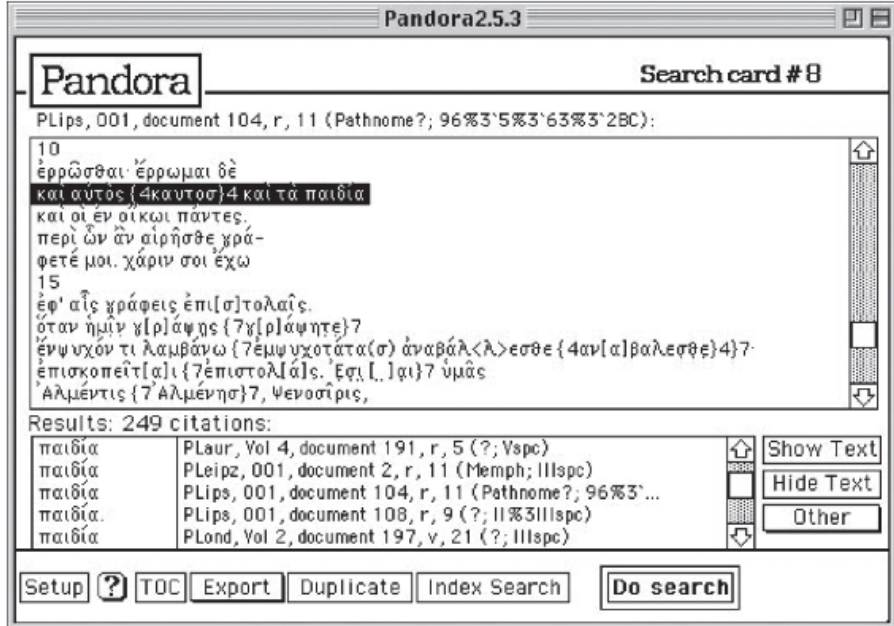


An *Ibycus* System (from <http://stephanus.tlg.uci.edu/history.php>).

~a «SokNcs»b«100 AD»c«P.Coll. Youtie 1»y33z1
 ές[ους] τρέ[ου] Αύ[το]κρί[α]ς[ο]ρ[ος] | Κα[ί]σ[α]ρος
 Τ[ραι]ανού Σεβασ[τ]ου Π[α]χ[ω]ν 7.
 διέγρ[αφε] Πολλί[ων] πράξ[ε]ς[ο]ρ[ος] άργ[υ]ρων
 + Σοκ[νο]σ[α]ου
 Τά[ω]θ 'Ατρώνος δι[α] γ[α]υ[λ]ο
 γυναικός (μ)ή[τ]ρος Τασίτος {6 τοις} 6 ύπ[ε]ρ
 + δη[μο]σίων
 [3] (έτους) βυπ[α]ρ[α]ς δραχμάς όκτω {4ο[κ] το[ι]4,
 + (γίνονται) (δραχμαί) 8.

~a~SokNcs~b~100 AD~c~P.Coll. Youtie 1~y33z1
 EYIT[OUS]TRELIT[OU]*AUF*POKKA/IT[OR]OK?
 -
 [KAI]/S[AROS]
 *TIRALANOU~ *SEBAST[OU]~*P[A]XW[ON]N[7]
 DIE/GR[LAYE] *PTOLLI/1WN[1] PRA/K[IT]OR[1]
 -
 A)RGH[ITURIKW=N]I *SO[IKNO]PAI/OU[1]
 *TA/UW[Q] *ATRPW=NOS DE[IAV]I APU[1]JU
 GLNAIKO[1]SI[1]MI[1]ITROS[1] *TOSU/LTOS [6TOS]OS[6]
 -
 U(P[1]EAK[1] DH[IMOSI/WN]1
 [3] [IE]/TOUS[1] R(UP[1]ARA[1]S1 DRAXMA[1]S O)KTW/
 [4]K[IT]P[1]C[1] [IGI/NONTA]1 [1:DRAXMAI]1 *8.

sample from the early DDBDP (P.Coll.Youtie I 33; screen output and Beta Code), from WILLIS 1984a, 170–1 (the ‘+’ marks a continuous line that is broken because does not fit the screen length).



couple of screenshots of the latest release of *Pandora* (from QUENOUILLE 2016).

File Edit View Go Help

Διογένης

PLond, Vol 7
document 1940, r2, 58

καὶ διὰ Πεπεχώντος τοῦ κυβερνήτου
καὶ τῶν χειριστῶν ἡγοράσθησαν
πύπυροι στεγάσιμοι· εἰς τὴν θαλαμῆν
πρὸς χαλκῶν (δραχμῶν) 11 πρῶτος 20
ἀνὰ (δραχμῆς) 6 (δραχμῆς) 4) καὶ τοῖς πορευθεῖσιν

Go to Context

PLond, Vol 7
document 2152, 3

[c ?] Θέων Κο. 1 Πρωτ Τ...[c ?]
[c ?] τὰ παρὰ [.] σου [c ?]
[c ?] ν [.] πύ[6] πύ(πύ) 9[c ?]

[c ?] Τουβίας κα...π...[c ?]

Go to Context

Dismiss
Full Screen

Perseus analysis of κυβερνήτου:

κυβερνήτης (steersman): masc gen sg

LSJ entry

κυβερνήτης

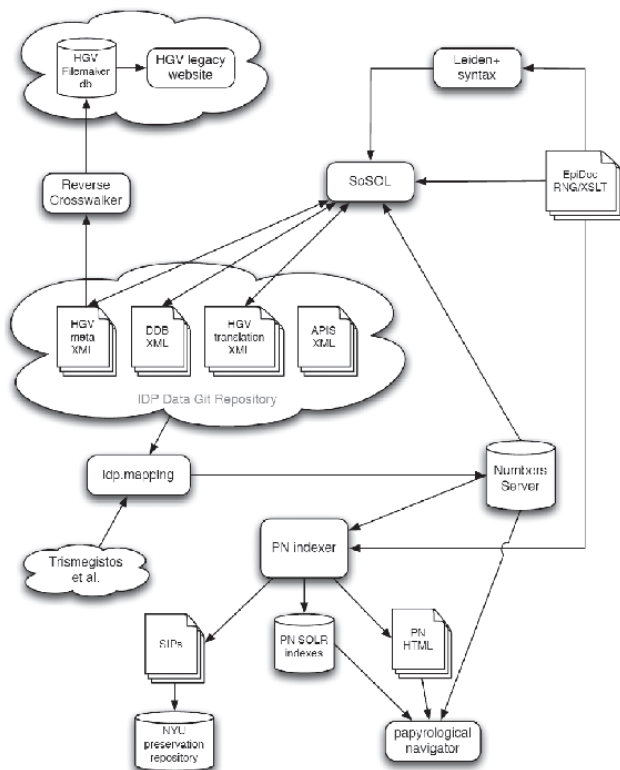
κυβερνήτης (Aeol. κυβερνήτης, q.v.), ου, ὁ,
steersman, pilot, Il.19.43, Od.9.78, A.Supp. 770,
Hdt.2.164, Ar.Th.837, Th.7.70, Pl.R.341c, etc.; skipper
of Nileboat, ναύκληρος καὶ κ. Pl.Ib.1.39.6 (iii B.C.), cf.
PGiss.11 (i A.D.), etc.

metaph., guide, governor, E.Supp.880,
Pl.Phdr.247c; as an official title, P.Masp.89 iii 1
(vi A.D.), etc.

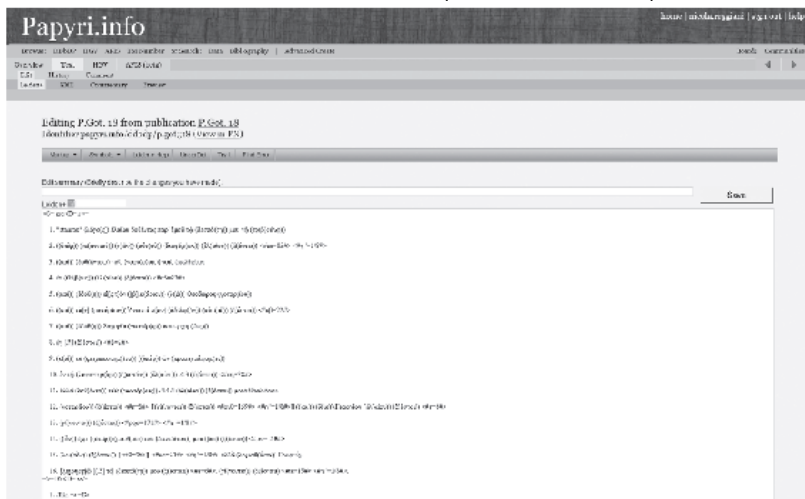
Previous Entry Next Entry

couple of screenshots of the latest release of *Diogenes*
(note, in the second one, the morphology and dictionary tool).

A

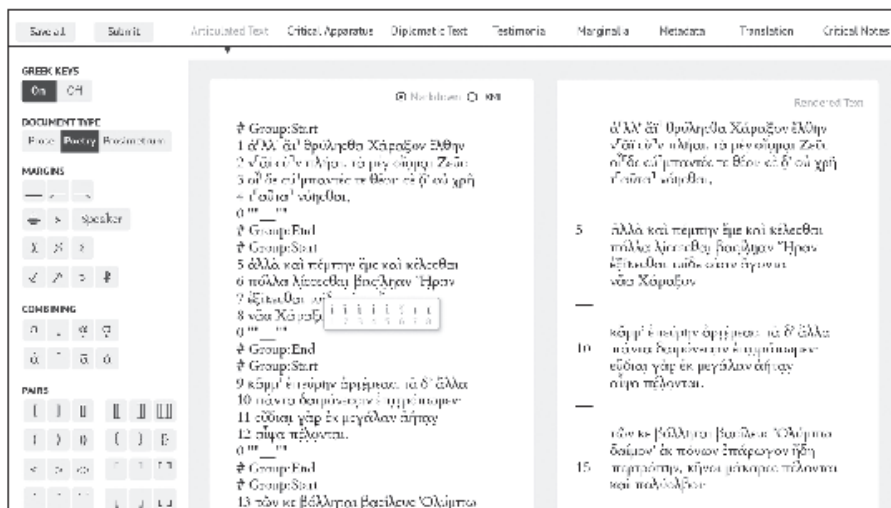
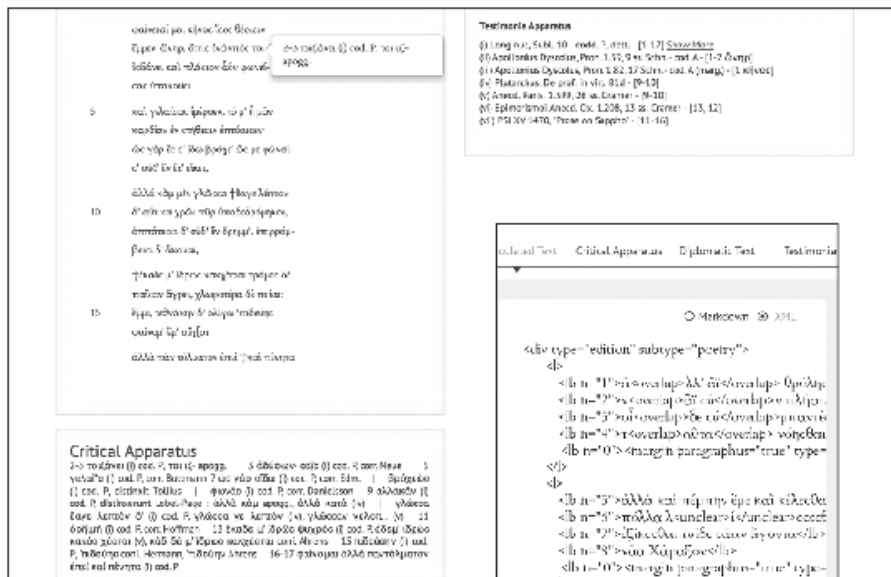


and data flow at the conclusion of IDP2" (BAUMANN 2013, 7). "Software components



Leiden+

(top) and XML (bottom) editing windows in SoSQL environment.



Some of the official screenshots of *Proteus* (apparatus, XML source, *Markdown* markup, and – in the next page – a collation of two different editions).

♀ (No. 2427) 400-450. Found: Gyzynchov (U, Egypt); western Egypt.

NCIP/IDAR Data [cont.]

KLP transcription (x.m)

Introduction

[illegible]

(This paper has been digitally edited by Stuart Haber as part of the Project "DIGIMONUMENT" under Marianneke Schrader's A Digital Medical Library based on Ancient Papyrus (JGU Würzburg, Grant Agreement no. 2019-0104) and the European Research Council at the University of Parma (Principal Investigator: Prof. Ivana P. Sacchi). The digital edition is mainly based on the papyrological edition of *Griffiths, M. (1965), P. Oxy. 1249, Papyri, Monographs (Louvain-la-Neuve, 1965)*.)

```

1  read v, m, r
2  read [v][v] [ m ]
3  v = v + m + r
4  read [v][v] [ m + r ]
5  v = v + m + r
6  read [v][v] [ m + r ]
7  v = v + m + r
8  read [v][v] [ m + r ]
9  v = v + m + r
10 read [v][v] [ m + r ]
11 v = v + m + r
12 read [v][v] [ m + r ]
13 v = v + m + r
14 read [v][v] [ m + r ]
15 v = v + m + r
16 read [v][v] [ m + r ]
17 v = v + m + r

```

Apparatus

```

34. f = f + 1; if (f % 10 == 0) cout << endl;
35. if (f % 10 != 0) cout << f << " ";
36. cout << endl; // Print the last number on a new line.
37. f = 0; // Reset the counter.
38. } // End of the function.
39. } // End of the program.

```

Notes

29

For the suggested reading in Case Nine, see J. L. Halberg, *Hippocampus*, 1993, pp. 149-160. For the suggested reading in Case Ten, see J. L. Halberg, *Hippocampus*, 1993, pp. 161-170.

9. c.

Center for Language Acquisition, 415 North Hall, University of Illinois at Chicago, Chicago, IL 60607, USA; e-mail: phillip@uic.edu

32

As an example, the authors, Murugan and others, provide a possible explanation as to why

44

¹¹ *Trametes versicolor* is a more readily bio-degradable reading of the schizo-minerals which would be the better for mycorrhizal formation and growth.

Editorial History: All History: (detailed)

2020/04 | Page | 11/19 | 2020 | Grant/Researcher

sample medical papyrus on DCLP

(<http://dclp.github.io/dclpxsltbox/output/dclp/61/60184.html>).

A

8From Textual Databases to Digital Scholarship

Le livre [*sc.* an electronic edition produced from a textual database] n'est plus qu'un produit secondaire. Ce qui compte vraiment, c'est le fichier, dont n'importe quel chercheur peut extraire le renseignement précis dont il a besoin.

Pruned of the thick crown of metadata, which we have dealt with so far, at the core of Papyrology there are the texts: it is therefore an easy equation to state that at the core of Digital Papyrology there is the textual data. As we saw in the previous chapter, the first steps of the application of electronic calculators to papyrological research were moved in the sphere of the textual databanks, and the very first developments of a dawning Digital Papyrology were envisaged in terms of digital treatment of the texts. Subsequently came the rest. And since texts are now again in the spotlight, after fruitful seasons of flourishing metadata platforms (now fully functional and run) and imaging techniques, it is appropriate to conclude our survey precisely with a focus on this complex and fascinating universe, which recovers and develops what is probably the oldest dream of Papyrology: the creation of a complete directory of papyrus documents for reference and search, that is – essentially – for comparison⁵³⁸.

8.1 Digital Encoding of Papyrus Texts: Theory and Practice

“Computational systems depend on resolving ‘real world’ situations into exact numerical strings”⁵³⁹. This means that when digitising texts (namely Greek papyrus texts, in our case) one must take care of designing a code that translates the textual information into machine-readable conventions, i.e. “input conventions”⁵⁴⁰. As already defined by R.J. Glickman, these must be designed for two types of data: the text proper and “identification labels”⁵⁴¹, i.e. all paratextual information, which differ slightly from what we called metadata in that the latter bear information about the papyrus as a material object and written artefact, while paratext bears information about the very essence of the text itself and of its linguistic / communicative contents. Paratext⁵⁴² is essentially the set of critical, diacritical, and punctuation signs that comes along with the text itself, whether in ancient or in modern times, being indispensable for its correct understanding⁵⁴³, i.e. human decoding.

Encoding text poses some issues when dealing with non-Latin characters, especially if the electronic environment is designed to support a limited set of alphanumerical signs and some other common symbols, as it was the case at the beginning of the digital era. Encoding paratext poses the same order of issues when dealing with specific conventional marks. Such issues – “the contemporary tower of Babel” in communication between men and machines, as it has been defined⁵⁴⁴ – are usually faced with the establishment of conventions, which can be more or less universally adopted but must be strictly followed in order to comply with the technological requirements:

basically, they must be as standardized as possible. This is not that different from what happens in a printed transcription or edition, where typographical conventions are used to represent papyrological texts and paratexts, and one must follow the Leiden editorial conventions as well as the standard guidelines of journals, series, or publishers. Once data is encoded, it has to be converted again in human-readable format, so that the researcher can benefit of the output obtained from the computer. Operations of reversal encoding, or decoding, are therefore necessary as well.

Encoding is normally effected through input from keyboard. If the computer does not support Greek characters, a ‘transliteration’ is required: the input is encoded in plain ASCII characters, and then the computer renders it in (polytonic) Greek glyphs. This happened with the earliest work (Alpha and Beta Code, see below, § 8.3) as well as through more recent times, until Unicode was introduced (see above, § 1.2). *LaserGreek*, *SuperGreek*, and similar custom typefaces allowed indeed for encoding Greek with particular combinations of ASCII alphanumerical keys; the resulting text was displayed in Greek characters thanks to specific typefaces. Codes were different from font to font, and from platform to platform, generating a great mess: the text was in fact encoded and processed in ASCII, so that if one did not possess the exact typeface with which it had been encoded, (s)he was not able to display it correctly – not to speak of display issues in many web browsers. The introduction of Unicode (see above, §1.2) solved most of the problems: input was now effected directly in the Unicode Greek subset codes through appropriate keyboard layouts⁵⁴⁵, ensuring cross-platform compatibility⁵⁴⁶. Unicode is in fact a great means of standardization, and its use is highly recommended, though unfortunately not universally adopted even today. Since some peculiar papyrological symbols were not included in the official Unicode release, some special Unicode font faces have been designed to support those missing glyphs in their own “private user area” (a special code range reserved for third-party personalizations) as well as nicer display of combining diacritics like the underdot⁵⁴⁷. The most used are likely *New Athena Unicode*, developed by Donald Mastronarde and distributed by the American Philological Association ([https:// apagreekkeys.org/NAUdownload.html](https://apagreekkeys.org/NAUdownload.html)), and *IFAO Grec Unicode*, developed by the Institut Français d’Archéologie Orientale (<http://www.ifao.egnet.net/publications/publier/outils-ed/polices>). Various utilities to convert legacy non-Unicode Greek text into Unicode have been released, and they prove very useful to recover old files, especially for the sake of entering papyrus texts in the textual databank⁵⁴⁸.

But we would see only half of the heaven (or of the hell...) if we did not take into consideration the encoding supports. As papyrologists are accustomed to deal with writing supports, their transformation over time and their intimate relation with the text they bear, digital papyrologists must cope with digital

supports and with their intimate relation with the digital text they host. Digital texts are highly support- and device-dependent, and their ultimate usability lays on the usability of supports and devices. The first supports were punched cards, pieces of stiff paper in which the information was represented, in a binary way, by the presence or absence of small holes in predefined positions, which calculators could interpret and process (see above, § 4.4). These were huge machines and the intermediation of specialized technicians was indispensable (see above, § 7.1): we may define them the ‘cuneiform tablets’ of Digital Papyrology. It is probably for this reason that for the first systematic and comprehensive databanks we had to wait for the introduction of magnetic tapes, which made things slightly easier – they could be distributed quite easily, but still required tape drives to be transferred to large computers –, and the development of micro-computers, from the mid Seventies, which enhanced the personal use of the electronic resources (see above and below, §§ 7.1 and 8.3). At first, the textual databanks (namely the *Duke Databank of Documentary Papyri*, see below, § 8.3) were mostly relegated to a specific computer system, the *Ibycus* designed by David Packard to store and manage the *Thesaurus Linguae Graecae* directly in Greek characters (see below, § 8.3) – we can compare this phase to ‘hieroglyphic rolls’, slightly handier than punched cards (our metaphorical incised tablets) but still reserved to a narrow *élite* of experts. The quick diffusion of many different computer systems urged the developers to grant the conversion of proprietary *Ibycus* code into a universal code that could be read also by machines that could not manage Greek characters. Betacode, developed by Packard himself in the late Seventies as a way of representing Greek characters and diacriticals by means of Latin characters and special marks (see below, § 8.3), became the first step towards universalism and standardization⁵⁴⁹ – a modern parallel to ancient ‘international Aramaic’, which became a sort of Mediterranean interlanguage also thanks to the ease of use of its alphabetic writing. The launch of the CD-ROM – a direct access memory device, sensibly smaller, more capacious, and faster than magnetic tapes, which were sequential access memory devices – facilitated the diffusion of the database, and at the same time the flourishing of special software programs designed to support the database on non-*Ibycus* systems⁵⁵⁰. The situation might now be compared, approximately, to classical antiquity: a widespread diffusion of Greek as ‘universal’ language declined in several handwritings, and a variety of writing supports with different characteristics and uses. Then, in 1991 Internet, the hypertextual revolution that completely changed the way of structuring and displaying data, saw daylight. This brought new ways of thinking the text in relation to the support, within the framework concept of tabularity that can be easily compared with ancient codex-format books⁵⁵¹.

The conversion of Digital Papyrology to the World Wide Web was not exactly straightforward: many digital projects of those years started, or planned to start, on CD-ROM, but soon after turned to the Internet (see above,

§ 1.2). Anyway, within less than ten years (1997) the *Duke Databank* was fully working online in the *Perseus* hypertextual framework (see below, § 8.3). It took ten more years (2006/7), with the IDP project and *Papyri.info* (see below, § 8.4), to fully understand and exploit the real potentials of online databanking: open access, integration of resources, worldwide collaboration – after some smaller, pioneering projects already exploited some or all of these potentials. It must be clear that what we are now dealing with is not a new encoding support: it is a completely different way of structuring and conceiving data, that is texts. But we will face this last challenge in the next chapter.

8.2 The Earliest Textual Databases

As anticipated above (§ 7.1), the first attempts to store Greek papyrus texts digitally were made in the Sixties at the LASLA in Liège under the guidance of Alfred Tomsin⁵⁵², and at the Centro di Documentazione Automatica in Milan founded by Enrico Maretti, under the guidance of Mariangela Vandoni⁵⁵³. Both teams used punched cards to store the texts in electronic calculators (see above, § 4.4). However, though the support was the same, each team chose to use a different type of encoding for the Greek texts. The choices were made on the ground of the different research purposes.

The Belgians were eventually interested, alongside research features, in the indexing functions⁵⁵⁴ and in the printed output of the data⁵⁵⁵, and therefore decided to encode directly Greek characters along with spirits, accents⁵⁵⁶, iota subscript, diaeresis, underdots, capital letters⁵⁵⁷, so that they needed to modify existing IBM machines⁵⁵⁸, since they normally did not support Greek direct input. They encoded one word per card, along with reference codes (end of sentence, end of line)⁵⁵⁹. What is striking, in the text processing, is the high flexibility of the method: later emendations were added at a second stage, so that it was possible to reproduce both the emended version and the original *editio princeps*, alongside the diplomatic transcription⁵⁶⁰; moreover, as already noted earlier, a strong linguistic focus produced a deep ‘annotation’ of lemmatized, morpho-syntactic and semantic information for each word. Such a system was able to accept most of the editorial symbols as in the Leiden conventions, but some had to be changed for technical reasons (see the summary table below)⁵⁶¹. In fact, when they presented their method at the 12th International Congress of Papyrology (Ann Arbor 1968), they distributed a print sample of their work, consisting of a significant selection of papyrus editions printed from their database in the different possible formats, with indices and concordances generated automatically⁵⁶². This *Choix de papyrus documentaires – Essai de traitement automatique* opens with a prophetic introduction by Louis Delatte, the founder and director of LASLA, the concluding paragraph of which is perhaps

worth to be quoted entirely for its historical and methodological significance:

si chaque centre de papyrologie disposait d'un système 870 [i.e. the IBM machine used at LASLA] et si un centre général doté d'un petit ordinateur regroupait tous les fichiers, il ne serait pas ridicule d'imaginer qu'en quelques années, un corpus général de papyrologie pourrait être constitué et exploité⁵⁶³.

It must be stressed that Delatte did not limit himself to prophesize a possible future database of all papyrological texts, but envisaged it in the same terms of worldwide collaboration that mostly inform Digital Papyrology today.

The Italians, on their side, aimed at providing the researchers with a work instrument easy and convenient, able to perform any possible search and based on a text that should be as close to the original as possible. For this reason, they encoded the texts in Latin transliteration, in capital letters, without diacriticals, and without any modern emendation/correction⁵⁶⁴. Special codes were assigned to proper names and numerals (whether in figures, spelled out or fractional), as well as text sections (paragraph beginning, initial or final break, line end with or without word break, column beginning, verso, end of the papyrus)⁵⁶⁵. A peculiar solution was adopted to indicate scribal corrections: $* C p = q * C$, where p is the original word and q the corrected one⁵⁶⁶. For other conventions see the summary table below. The experiment comprised a sample *corpus* of 50 Milan papyri and a program called ARSINOE, which was divided into five subroutines: ARSINOE 1 converted the machine-readable codes into human-readable format (e.g. adding line numbers, resolving abbreviations...) and checked possible 'syntax' mistakes in the perforation of the cards (e.g., a lacuna opened but lacking its closing code⁵⁶⁷); ARSINOE 2 aimed at searching and extracting words for building indexes/concordances; ARSINOE 3 was devoted to the search for spelling variants; ARSINOE 4 and 5 performed searches for complex formulas⁵⁶⁸.

Subsequently, Tomsin decided to apply the same automated method as used for *Choix* to the study of a dossier of papyrological documents related to the imperial estates in Egypt (*ousiai*), envisaging a true quantitative analysis of the digital texts through partially automated lemmatization and semantic annotation, which produced special thematic indices (geographical, prosopographical, topographical, etc.)⁵⁶⁹. It is a clear example of the potentials of a deeply annotated *corpus*: essentially, text and metadata integrated in a single, powerful database.

Of course, as Delatte himself noticed, punching cards to encode the basic data of all published papyri would have required an enormous work by several papyrological teams worldwide; but it is a real pity that when input methods became less complicated papyrus texts were digitized without annotations. This was still a priority when a project for digitizing all published documentary papyri from Oxyrhynchus was launched at Oxford in the late Seventies. Presented at the 16th International Congress of Papyrology (New

York 1980), the *Oxyrhynchus Computer Project*⁵⁷⁰, led by Peter Parsons, intended to encode texts along with quite detailed metadata: volume and edition number, of course, but also reference to photographs, bibliographical information, type of document, relevant subjects, date, current location, information on the other side, physical information. Texts were encoded in continuous transliteration (with possibility of converting to formatted Greek) and without editorial corrections. Further deep annotation stages were planned:

[n]umerals will need to be marked off in these texts to avoid their useless incorporation in word lists, as will words within restorations, affecting these same word lists and statistics based on them. Personal and geographical names, and the names of months, require distinction. Other specialized matters remain for the future, the largest being comprehensive lemmatization; marking off of homographs; analysis of syntactic function; and incorporation of scholarly conjectures and corrected orthography⁵⁷¹.

Unfortunately, this remained a wish, as the next generation of textual database would be slightly different in shape and scope.

8.3 The *Thesaurus Linguae Graecae* and the *Duke Databank of Documentary Papyri*

1972 is the year of the *Thesaurus Linguae Graecae* (TLG), the tool that revolutionized the entire field of classical studies. The goal of the project, started at the University of California-Irvine under the direction of Theodore F. Brunner and funding by Marianne McDonald, was essentially to create a digital *corpus* of Greek literary texts from Homer to AD 600, later expanded to a selection of Byzantine works. Much has been written on TLG⁵⁷² and it would be odd repeating everything here: but the event has been so paramount to deserve some notes. In particular, I would like to focus on some key features of the databank, and on the question whether it can be considered a ‘papyrological’ tool. Since the latter is a significant methodological and epistemological point, I will start with it.

In fact, the question has already been asked by Brunner himself, in the context of the 20th International Congress of Papyrology at Copenhagen (1992), and his authoritative answer was positive:

Ἐν ἀρχῇ ἦν ὁ λόγος – without an understanding of the words that it carries, any piece of papyrus would be merely a meaningless scrap of desiccated organic matter. One of the primary purposes of the *Thesaurus Linguae Graecae* is to provide us with a better understanding of text – of the use of words, and the relationship between words. Electronic data banks are superbly suited to facilitate the attainment of such understanding. Philologists, historians, linguists, theologians, and other non-papyrologists

have been using the TLG's resources for quite some time as a means to analyze and understand their raw material – their texts. In fact, the past few years have witnessed almost a quantum jump in the quantity and quality of scholarly publication in direct consequence of the availability of the TLG resource. Moreover, the availability of large text corpora in electronic (and thus easily accessible) form has stimulated research in areas long neglected simply because the raw materials were too extensive to be dealt with by means of traditional methodologies: 2.5 million words of Galen, or 4.5 million words of John Chrysostom suddenly no longer seem quite as formidable, now that they are accessible via a computer search consuming but a few minutes. Papyrologists can reap equal benefit from using the TLG as one of their basic research tools⁵⁷³.

He gave some practical examples of unidentified literary fragments assigned to known authors thanks to the comparison with TLG texts, and of previously mismatched pieces then correctly reassigned⁵⁷⁴. It is therefore in such “computer-Früchte”⁵⁷⁵ – a neologism created by the same Brunner after the typical German expression *Lesefrüchte* – that we must see the main reason for which TLG “can be used as a papyrological tool”⁵⁷⁶: we have already presented the enthusiastic report by William Willis on its fruitful papyrological exploitation, and other similar cases can easily be evoked as well⁵⁷⁷. And since TLG is basically a philological resource (the encoded texts belong to literary material), it is really to be seen – again in Brunner's own words – as a “unifying force”, a meeting point that can enable scholars from different fields to work together⁵⁷⁸, in view of that cross-disciplinary utopia that probably only digital tools, in their almost infinite potentials, can ensure (see above, § 3.3, the case of *Trismegistos*, expanding from Papyrology to more universal horizons). Moreover, we should not forget that TLG does in fact include papyrological texts, if they are the sole testimonies of literary authors⁵⁷⁹.

The technical details of TLG are of the utmost importance to understand the subsequent development of the biggest papyrological textual databank. The papyrological outcome of TLG is essentially literary, since it collects literary texts, while all papyrological digital resources before and for several years after it were devoted to ‘documentary’ data⁵⁸⁰. It has been probably a matter of perspective that made the literary side of the texts prevail on the papyrological one for technical reasons, though Brunner himself expressed his wish that the gap could be filled and that “one of the Ds in DDBDP will disappear, and that a Duke Data Bank of Papyri will ultimately contain literary fragments and documents alike”⁵⁸¹.

The issues of the literary texts stored in TLG are well known and it is sufficient to enumerate them very quickly: the selection of one canonical edition and the absence of an apparatus criticus make it a powerful lexicographical tool, but not exactly an exhaustive scholarly reference⁵⁸². It can therefore be utilized with success, but being aware of the unavoidable risks and shortcomings; and this is even truer with Papyrology, since papyri very often attest to philological or linguistic variants that may differ from the accepted restitutions, or can even be unattested in the manuscript tradition.

These circumstances of course affect the comparison of papyrus texts with the TLG databank, making Brunner's wish for a database of literary papyri even more striking. Fortunately, this dream is going to be fulfilled, as we will see below (§§ 8.6–7).

From the merely technical viewpoint, the early TLG system used a Varian 620L minicomputer tied into Irvine's mainframe. The texts were entered in the so-called Alpha Code, which conventionally used ASCII Latin characters and common symbols to represent Greek letters and diacriticals. Both hardware and software had been designed by the visionary classicist David W. Packard, founder of the Packard Humanities Institute and son of the co-founder of *Hewlett-Packard* computer industry, who specifically implemented them to store, process, search, and display ancient Greek texts⁵⁸³. Between the late Seventies and the early Eighties (1981) Packard developed new hardware and software and launched the *Ibycus System*, an IBM-modified self-standing mainframe adapted to philological work, being specifically designed "to store, read, edit and search texts in Greek and Latin"⁵⁸⁴, as well as Beta Code, an enhanced release of the Greek encoding conventions. Beta Code uses upper-case Latin characters to represent Greek letters (a capital Greek letter is marked with an asterisk before it) and non-alphabetical common signs (parentheses, slashes, equals, pipe) to indicate spirits, accents, iota subscript (these must be added after the vowel, in the order: breathing-accent-iota subscript)⁵⁸⁵. *Ibycus System* used magnetic tapes to store information.

It was in fact around an *Ibycus System* that the project of creating a textual databank of all documentary papyri was developed at the Duke University (Durham, NC), under suggestion of Packard and direction of John Oates and William Willis⁵⁸⁶. Ten years earlier, TLG had abandoned the idea of including documentary papyri in its databank due to the technical difficulties of handling fragmentary texts; but the *Oxyrhynchus Computer Project* digitizing documentary papyri (see above, § 8.2) had also demonstrated that such a task was feasible. Therefore, the project officially started in 1982 and all published documentary papyri (i.e. Greek and Latin papyri, parchments, *ostraka*, and tablets from the III century BC to the VIII AD) started to be entered in Beta Code on magnetic tapes by means of the *Ibycus* machine acquired by Duke. There, texts were typed directly in Greek⁵⁸⁷, and automatically converted in Beta Code by the system; subsequently they were proofread against the printed editions and the photographs at the University of Michigan under the direction of Ludwig Koenen⁵⁸⁸. The more recent editions were entered first, followed by the others backwards. Magnetic tapes were then released by Duke and delivered on request: the Beta Code could be easily displayed or printed in Greek characters by any conversion algorithm.

However, encoding papyri was not an easy task⁵⁸⁹, and it became necessary to apply some enhancements to the Beta Code. Indeed, TLG came without apparatus, but when dealing with papyri it is vital to consider the spelling

variants and their regularizations in conventional Koine Greek, as well as scribal mistakes and their corrections: quite a different concern than TLG, which stands as a further example of the papyrological care for the actual text in its precise features, as already seen in the earlier LASLA and Milan attempts at encoding emendations and editorial annotations. A new method was developed at Duke to encode such misspellings in the digitized texts, so that they could be easily retrieved with queries:

the conventional *koine* form is given first, followed by numbered braces enclosing the scribe's form or the edition's misprint: e.g., ὄνομα {4ωνομα}4 shows that the scribe has misspelled ὄνομα, ὑπερ {5υπαρ}5 that he wrote epsilon over alpha, αὐτοῦ {6αντω}6 that he miswrote dative for genitive, Ἀθῶν {7Αθῶς}7 that the edition has a misprint for Αθῶν⁵⁹⁰.

Special codes were introduced to encode original diaeresis (#80) and apostrophe (#81), as well as to represent other papyrological features like illegible characters or expanded abbreviations (see summary table below) and numerals, transcribed with the Arabic digit preceded by a grave accent⁵⁹¹. A manual was appended to each magnetic tape for ease of use⁵⁹². Thus, though the databank was admittedly designed to be a lexical and concordancing tools similar to TLG and not a substitute for printed critical editions⁵⁹³, some articulated linguistic annotation was inserted somehow. Basic metadata (provenance, date, edition reference) were also added to each text in order to catalogue it and facilitate browsing; a more articulated set of metadata, including inventories, categorization, physical and palaeographical description, reference to photographs, was planned, though never developed⁵⁹⁴. This was the picture of the *Duke Data Bank of Documentary Papyri* (DDBDP; later *Databank*, thence the slightly different acronym DDbDP) as portrayed by Willis at the 17th International Congress of Papyrology (Naples, 1983)⁵⁹⁵.

In the following years, DDbDP absorbed the Oxyrhynchus papyri from the Oxford project, conveniently adapted to the new conventions⁵⁹⁶, and took great advantage of technological innovation coming from David Packard and the TLG project. Indeed, in 1985 the former launched *Ibycus Personal Scholarly Computer* (PSC), a machine equipped with the same features as *Ibycus System* but of a smaller size, which could read the new optical memory support called CD-ROM. The conversion of TLG to the CD-ROM was completed in the same year, and the TLG CD-ROM A was released by the Packard Humanities Institute (PHI). It is also known for having been the first published compact disk that did not contain music⁵⁹⁷. Both *Ibycus* PSC and the CD-ROM favoured the diffusion among scholars not only of the tools themselves, but also of a general technological know-how⁵⁹⁸. DDbDP converted itself to optical technology soon after TLG. In 1986, at the 18th International Congress of Athens, Willis announced the forthcoming news⁵⁹⁹, and presented them at the next meeting in Cairo (1989)⁶⁰⁰: the PHI-produced

CD-ROM 2 (no. 1 being devoted to Latin and biblical texts), containing all documentary papyri published in 275 volumes between 1936 and 1988, totalling 19,500 texts containing 2.41 million Greek and Latin words, and an updated version of the *Checklist*, the conventions of which had been chosen to cite the papyri⁶⁰¹.

The impact of both resources on the papyrological community was immense; about twenty years later, Isabella Andorlini recalled that occasion with the following enthusiastic words:

Già nel 1989, in un disadorno corridoio dell'Università egiziana del Cairo che ospitava il XIX Congresso Internazionale di Papirologia, il collega Robert Kraft (University of Pennsylvania) si presentò attrezzato con computer, banca dati e sistema d'indagine *Ibycus* e fu in grado di fornire in tempo reale a chi lo domandasse le ricorrenze delle parole dei papiri nei testi della letteratura greca compattata su CD-ROM⁶⁰².

Similarly, DDbDP on CD-ROM offered the possibility of wide-range speedy searches for words, phrases, strings, with or without blank spaces, but also for spelling variants, by searching for the labels instead of the words themselves⁶⁰³: “The value for editing texts justifies the creation of the data bank, but it also opens doors for historical, economic, and sociological studies as well as linguistic and stylistic analyses”⁶⁰⁴. This is an interesting statement: the original goals of a papyrological textual database remained unchanged, though many searching options were not embedded in the very texts any more⁶⁰⁵, and required the development of further tools.

The launch of DDbDP on CD-ROM, in the middle Eighties, coincided with the worldwide spread of personal computers: IBM PC dates to 1981, *Apple Macintosh* with its innovative graphical interface to 1984, and both operated with their own hardware and software architecture⁶⁰⁶. Since the database was specifically designed for *Ibycus* systems, third-party software was developed to allow processing the databank on different operating systems⁶⁰⁷. For example, *Searcher* was produced at the University of California-Santa Barbara for IBM machines; but the most famous and widespread were the *Macintosh* programs, namely *SNS Greek & Latin* developed at the Scuola Normale Superiore in Pisa⁶⁰⁸ and above all *Pandora*, designed by the *Perseus Project* at Harvard and based on *HyperCard* stacks⁶⁰⁹.

In the Nineties, in particular, the software production for consulting the classical databases on CD-ROM – a second edition of the *Duke Databank* is dated to 1991, within PHI #6⁶¹⁰; a third one to 1997, within PHI #7⁶¹¹ – flourished in plenty of different tools, for different platforms, with partially different functions, working and producing output in different character sets (font faces), almost not compatible with the other operating systems⁶¹²: one may refer to a useful list provided by the TLG website itself for a full overview updated to 2009⁶¹³. In a more or less sophisticated way, all these programs were able to process several different automated operations on the textual databank – word/phrase/string searches at various level and in

personalized sub-*corpora*; index lists; sorting; browsing; displaying/exporting; etc.

The confusion was quite great, and one had to choose carefully according to needs and preferences because fees had to be paid for most of these programs, and sometimes also for some proprietary fonts used by them for output. Fonts that, in turn, often created severe compatibility problems across platforms. These issues are well known and it is not worth dealing with them in details. Suffice it to recall that though most of these tools are now discontinued – *Pandora*, for example, in its latest release 3.0, developed by Daniel Riaño, does not run on the newer Intel-based *Macintosh* operating systems –, if one is in need for consulting the *Duke Databank* on PHI #7 CD-ROM (or the TLG CD-ROM) can still rely on a simple but powerful open-source, cross-platform and Unicode-compatible software: *Diogenes*, written by P.J. Heslin (Durham, UK) in *Perl* script and *XULRunner* runtime environment (the same as *Mozilla* browsers), which can be installed also in server mode and runs on *Mac OS X*, *Windows*, *Linux*⁶¹⁴. This might still be an option for the unavoidable moments of Internet blackouts and it provides a rather helpful embedded engine for morphological analysis and links to a stand-alone electronic version of Liddell-Scott, being therefore a sort of offline version of *Perseus* (see below), but be aware that the latest DDbDP CD-ROM release covers publications up to 1996 only.

Pandora2.5.3

Pandora

Search card #8

Simple search:

παῖδα

↑

↓

☐ Whole words or phrases
☒ Fragments
☐ Accents important
☐ Match unknowns

Search in:

DDP0085 • PKron

DDP0086 • PLaur

DDP0087 • PLeedsMus

DDP0088 • PLeidInst

DDP0089 • PLeiz

↑

↓

Clear Search

Complex search...

Select Works

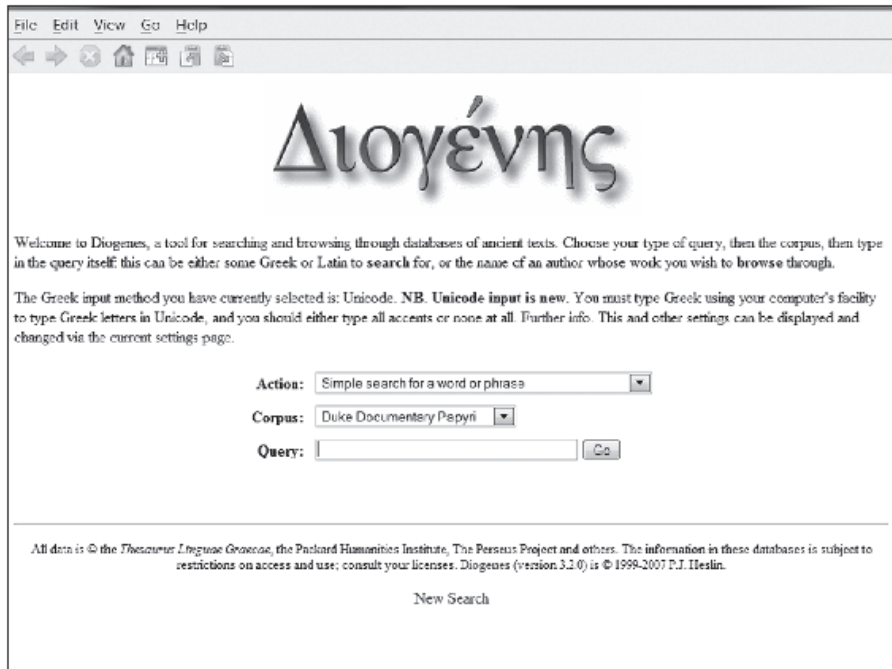
Delete Work

Results: 70 citations:

παῖδα	PIFAO, Vol 2, document 30, 4 (?; IIspc)	↑	Show Text
παῖδα	PIFAO, Vol 2, document 39, 9 (?; IV-Yspc)	↓	Hide Text
παῖδα]	PIFAO, Vol 2, document 45, r, 4 (?; I%3IIspc)	↑	Other
παῖδα	PIFAO, Vol 2, document 48, FrA, 3 (?; III%3IVspc)	↓	
παῖδα	PKoeln, Vol 5, document 222, 11 (Heranome; 145BC-)	↑	
παῖδα		↓	

Setup ? TOC Export Duplicate Index Search

Do search



Indeed, the development of the Internet, as from 1991, opened new ways of conceiving the management of information (see above, § 1.2). Following the trend of other resources, also DDbDP moved on line, and in 1996/7 migrated from PHI #7 CD-ROM to the open, web-based *Perseus Project*, the renowned hypertextual online digital library hosted at Tufts University and directed by Gregory Crane (<http://www.perseus.tufts.edu>)⁶¹⁵. *Perseus* still offers a powerful platform: not only does it store information in an open universal format, but also develops automated routines of search and analysis. It is particularly remarkable the *Greek Word Study Tool* (<http://www.perseus.tufts.edu/hopper/morph>), which allows performing morphological analysis of ancient Greek words and cross-referencing each to the corresponding entry in an online version of Liddell-Scott-Jones' *Greek-English Lexicon*, as well as in the abridged version called *Middle Liddell*. Each word in the classical *corpus*, including Greek and Latin literature – original texts and English translations, can be analysed with this tool, and search functions for exact forms or for all inflected forms of a lemma.

Perseus texts were marked with SGML (recently moved to XML) compliant with TEI⁶¹⁶, and therefore it was necessary to apply this markup to the plain Beta Code of DDbDP. The online search options proved very powerful: “l’impresa risulta tanto più straordinaria in quanto è la prima volta che su Internet appare un corpus complessivo di documentazione sul mondo antico in lingua originale”⁶¹⁷. The *Duke Databank of Documentary Papyri*, regularly updated, has been hosted by the *Perseus Digital Library* until 2010, when a completely different online platform was eventually released.

8.4The *Papyrological Navigator*

In 2004/5 DDbDP (led by Oates, then passed away in 2006, and by Josh Sosin) started collaborating with HGV (led by James Cowey) to map the datasets of both to each other. But the sustainability of the entire *Duke Databank* was at stake: the increasing amount of primary data, favoured without doubts, in turn, by the spread of the digital techniques, was making update increasingly difficult and economically unaffordable for the small team at Duke, especially with the end of income from the CD-ROMs. In the meantime, Roger Bagnall had gone on with the concept of resource integration envisaged at least since 1992⁶¹⁸ and developed with APIS (see above, § 3.6). In 2006, at Columbia University, he promoted the prototype of a new database based on portlet technology (different web modules contained by a portal) and a powerful image display platform: the idea was to aggregate digital pictures (mainly via APIS), metadata (via HGV and APIS), and text (via DDbDP) in a single hub⁶¹⁹. The project was called *Papyrological Navigator* (PN) and served as the starting point for a subsequent, wider project named *Integrating Digital Papyrology* (IDP), which started in 2007 with the goal of setting common standards in the papyrological resources and enhancing simultaneous access to them through a single interface, involving several different institutions (Columbia, King's College London, New York University, Heidelberg Institute of Papyrology, University of Kentucky, Duke University) across the years⁶²⁰.

Integration is based on the RDF (*Resource Description Framework*) model, which allows for connecting and merging the different sources in the framework of the so-called “Semantic Web”, and for possible further connections in the future⁶²¹.

The legacy encoding and markup of the *Duke Databank* via *Perseus* (Beta Code and SGML) were converted to modern, robust and shared standards: Unicode and the TEI/EpiDoc XML schema⁶²². Migration from Beta Code to Unicode was run through a *Transcoder* module⁶²³, and then another applet (*Chapel Hill Epigraphic Text-Converter* = CHET-C, originally designed for digitizing epigraphical texts⁶²⁴) was used to convert the Leiden editorial conventions of DDbDP, including legacy Beta Code escapes, into standard EpiDoc XML markup⁶²⁵. A further effort was required by the encoding of digits, which had been entered as Arabic numerals in the earlier DDbDP: a *Greek Number Converter* was applied to transcode them to the corresponding Greek Unicode characters and to add XML numerical tags for future computational applications. HGV metadata underwent the same migration to XML. However, the DDbDP conversion was run as a single and ultimate process, so that all future work would be conducted directly in Unicode and EpiDoc XML. On the contrary, HGV would continue to be maintained in its *FileMaker* database at Heidelberg, and its conversion would therefore have to be regularly repeated: this was obtained with a process called *HGV Metadata*

Crosswalk, an XSLT that can convert the XML output of *FileMaker* into EpiDoc-compliant XML⁶²⁶; an *HGV Translation Crosswalk* was similarly applied to HGV German and English translations. The three separated XML outputs (DDbDP, HGV metadata, and HGV translations) were then merged into a unique XML file by an *Aggregator*, which was also able to process items provided with HGV metadata but lacking DDbDP text, allowing for their future addition. To merge DDbDP texts with HGV metadata, the unique numerical identifiers assigned by *Trismegistos* to the papyri (TM number: see above, § 3.3) played an essential bridging role⁶²⁷. Customized EpiDoc XSLT stylesheets were then applied to generate plain text (UTF-8) and HTML output from the XML files, in order to obtain a human-readable version of the content, featuring text, metadata, image, and translation juxtaposed in a synoptic view (see above, § 3.1).

The output has been indeed designed according to the typical papyrological editions, with Leiden conventions, metadata above text, a basic apparatus criticus below, etc.⁶²⁸ In this way, it has been designed a new concept of textual database, fully integrated with metadata (according to the earliest attempts) and featuring an apparatus criticus showing alternative readings, spelling variants, editorial corrections⁶²⁹. Below, a short text (SB XIV 11942, the early papyrus of Peukestas) with simple samples of Leiden critical marks (square brackets for ancient deletion) and of apparatus entries (regularization of iotacism), in both XML source and HTML output:

```
<?xml-model href="http://www.stoa.org/epidoc/schema/8.16/tei-epidoc.rng"
type="application/xml" schematypens="http://relaxng.org/ns/structure/1.0"?>
<TEI n="0239;14;11942" xml:id="sb.14.11942" xml:lang="cn">
<teiHeader>
```

```

<fileDesc>
  <titleStmt>
    <title>sb.14.11942</title>
  </titleStmt>
  <publicationStmt>
    <authority>Duke Collaboratory for Classics Computing (DC3)</authority>
    <idno type="filename">sb.14.11942</idno>
    <idno type="ddb-perseus-style">0239;14;11942</idno>
    <idno type="ddb-hybrid">sb;14;11942</idno>
    <idno type="HGV">4274</idno>
    <idno type="TM">4274</idno>
    <availability><p>§ Duke Databank of Documentary Papyri. This work is
      licensed under a <ref type="license" target="http://creativecommons.org/
      licenses/by/3.0/">Creative Commons Attribution 3.0 License</ref>.</p>
    </availability>
  </publicationStmt>
  <sourceDesc><p/></sourceDesc>
</fileDesc>
<profileDesc>
  <langUsage><language ident="en">English</language><language ident="grc">
    Greek</language></langUsage>
</profileDesc>
<revisionDesc>
  <change when="2012-10-26T08:50:07.916-04:00" who="http://papyri.info/editor/
    users/james.cowey">Finalized - Ready.</change>
  <change when="2012-10-26T08:50:07.903-04:00" who="http://papyri.info/editor/
    users/james.cowey">Vote - Accept-Straight-to-Finalization - Good catch.
    Fine.</change>
  <change when="2012-10-23T10:45:17.621-04:00" who="http://papyri.info/editor/
    users/simoesis">line 2: reg tag added and --> </change>
  <change when="2011-12-14" who="http://papyri.info/editor/users/
    gabrielbodard">rationalized languages in langUsage</change>
  <change when="2011-12-14" who="http://papyri.info/editor/users/
    gabrielbodard">changed editor names to URIs</change>
  <change when="2011-10-31" who="http://papyri.info/editor/users/
    gabrielbodard">changed type=inWord to break=no</change>
  <change when="2010-05-05" who="http://papyri.info/editor/users/
    gabrielbodard">changed schema; added xml:space=preserve; indented; moved
    title/@n to idno</change>
  <change when="2009-11-12" who="http://papyri.info/editor/users/

```



```

gabrielbodard">Added language la-Grek</change>
<change when="2009-06-27" who="http://papyri.info/editor/users/
gabrielbodard">Converted from TEI P4 (EpiDoc DTD v. 6) to P5 (EpiDoc RNG
schema)</change>
<change when="2008-12-23" who="http://papyri.info/about">Automated split
from transcoder files</change>
</revisionDesc>
</teiHeader>
<text>
<body>
<head n="4274" xml:lang="en">
<date>331BC?</date>
<placeName>Saqqara</placeName>
</head>
<div xml:lang="grc" type="edition" xml:space="preserve">
<ab>
<lb n="1"/><del rend="erasure"> </del>
<lb n="2"/>
<lb n="3" break="no"/> <choice><reg> </reg><orig>
</orig></choice>
</ab>
</div>
</body>
</text>
</TEI>

```

DDbDP transcription: sb.14.11942 [xml]

331BC? Saqqara

[1] Παιδείου
μή παραπορεύεσθαι μή
δέου· ἰπρίαι(εῖ) τὸ οἰκίαια.

Apparatus

^ 3. 1. ἰπρίαια

Editorial History: All History: (detailed)

2012-10-26T08:50:07.916-04:00 [james.cowey]: Finalized - Ready.
2012-10-26T08:50:07.903-04:00 [james.cowey]: Vote - Accept-Straight-to-Finalization - Good catch. Fine.
2012-10-23T10:45:17.621-04:00 [simoes]: Line 2: reg tag added and to --> τὸ

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Another striking innovation is that

the complete set of IDP XML files are published with a Creative Commons Attribution 3.0 License, explicitly permitting the typical varieties of scholarly reuse and citation anticipated for the data, in line with other recent calls for open access in the humanities⁶³⁰.

As in the traditional print editions, each item has a call number, which in this case is represented by the permanent URL assigned to it. This means partial

standardization, since each URL is unique. However, since each resource (HGV, DDbDP, APIS) has its own URLs, following its own conventions, it happens very often that an item has three different URLs (e.g. <http://papyri.info/ddbdp/p.got;;101> = <http://papyri.info/hgv/30696> = <http://papyri.info/apis/gothenburg.apis.112>), even more if it has been republished (e.g. <http://papyri.info/ddbdp/p.got;;20> = <http://papyri.info/ddbdp/sb;20;14671> = <http://papyri.info/hgv/38507> = <http://papyri.info/apis/gothenburg.apis.14>). Also in this case, a unifying factor is given by TM numbers, acting as unique identifiers (30696 and 38507, in the given examples).

On the access side, PN deploys a user-centred interface (<http://papyri.info/search>). The search functions are particularly articulated and represent a decisive improvement with respect to the *Perseus* platform, though no morphological analysis is possible any more⁶³¹. They have been constantly enhanced during the past years⁶³². Full-text word, phrase and substring queries in texts, metadata or translations support Betacode/Unicode input, proximity customizations (definition of proximity character or word ranges⁶³³), Boolean operators (AND, OR, etc.) for combination of strings, regular expressions⁶³⁴, search for abbreviations⁶³⁵, lemmatized searching (via a term index built by mapping the original word forms to the morphological tables developed by the *Perseus Project*), case-⁶³⁶ and diacritic-sensitivity. Documents can also be browsed and searched by inventory and edition reference, provenance, date, language. Any kind of query generates a single searching instance, which may be combined with others or subsequently narrowed by closing the appropriate instance, which is displayed as an autonomous box on the top of the resulting list of hits. The results are sorted by publication reference, and a quick preview of date, provenance, and the immediate context of the word(s) searched for are provided⁶³⁷. Of the integration with the *Bibliographie Papyrologique*, active since 2011⁶³⁸, we have already discussed above (§ 2.1); we can just add that, unlike the previous versions of DDbDP, *Papyri.info* features also Coptic texts⁶³⁹, and some preliminary attempts to add Unicode Arabic texts worked fine, despite the different right-to-left direction of writing⁶⁴⁰. A bigger challenge for the future might be taking into consideration Demotic documentary texts:

Demotic is a more difficult matter, as it seems impossible to define a standardized set of characters, and therefore a Unicode encoding standard, for a script with so many variations from one scribe to the other, not to mention the different methods of transcription used around the world⁶⁴¹.

p.hagnall.01	1.642	p.hagnall.02	1.642	truncagelens.201.04	chla.2.2.1442
	submarine sand		Antarctica		

Year	Number of cases	Number of deaths
1990	100	10
1991	110	11
1992	120	12
1993	130	13
1994	140	14
1995	150	15
1996	160	16
1997	170	17
1998	180	18
1999	190	19
2000	200	20
2001	210	21
2002	220	22
2003	230	23
2004	240	24
2005	250	25
2006	260	26
2007	270	27
2008	280	28
2009	290	29
2010	300	30
2011	310	31
2012	320	32
2013	330	33
2014	340	34
2015	350	35
2016	360	36
2017	370	37
2018	380	38
2019	390	39
2020	400	40

var date = new Date();
document.write("Date: " + date.toDateString());

GV: P. Depnelli 3 (source, Jamil)

[illegible]

Телефон: 70133 (адрес)

Publication	F. Reguly, G. G. A. Kerekes
Journal	Harvesting, M. J. K. Kerekes, P. J. Kerekes, H. Kerekes (M) Kerekes, P. J. Kerekes
URL	12
Language	English
Provenance	Local
People	G. G. A. Kerekes, G. G. A. Kerekes, G. G. A. Kerekes
Place	unpublished

Catalogue Record: [duke:uiux.30563451](#) [xml]

[illegible]

CC-BY transcription: p.beynall@uq.edu.au

[illegible]

Figure 2

$$t = \frac{F - s^2}{1 + s^2} + \frac{F - s^2}{1 + s^2} + \frac{F - s^2}{1 + s^2}$$

Apparatus

* = p -Adams spectral sequence converging to $H\mathbb{Z}/p$ -homology
 $\dagger$ = p -Adams spectral sequence
 $\ddagger$ = p -Adams spectral sequence

Notes

1. It is possible for two different values of α to result in the same β .

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It is an interesting question whether the current is a function of the rate of change of the magnetic field.

8.5 The *Papyrological Editor*

The most revolutionary improvement came during the second stage of the

Integrating Digital Papyrology project (IDP2, 2008–2010): alongside some residual fix from the preceding phase, an innovative method was deployed to ensure an appropriate update of the *Duke Databank* in the face of the increasing scholarship in the field and of the parallel increasing shortage of economic and human resources at Duke⁶⁴². The idea of a dynamic web-based editorial platform open to contribution from the entire papyrological community owed much to Ross Scaife's pioneering project of making the translation of *Suda* (the X-century encyclopaedic lexicon) open to the users' contributions, according to the web concept of *wiki* (Hawaiian for "quick") i.e. collaborative editing of hypertextual pages, developed as of 1995⁶⁴³. Scaife's project, called *Suda On Line* (SOL, www.stoa.org/sol)⁶⁴⁴, started in 1998 (three years before *Wikipedia*), and its legacy is reflected in the name chosen for the software environment conceived for the papyrological collaborative platform: *Son of Suda On Line* (SoSOL), which is admittedly a tribute to Scaife's idea. The collaboration takes place in the so-called *Papyrological Editor* (PE, <http://papyri.info/editor>), a platform where any registered user can edit existing database entries or adding new items. Since IDP uses *Git*, a distributed version control system designed to handle multiple versions of project information, as its public data repository (via *GitHub*), since 2011⁶⁴⁵, all changes to the dataset are recorded and tracked in a version history⁶⁴⁶ (see picture above):

[p]ermanent transparency is the guiding principle behind SoSOL. The system keeps track of everything. When you log in and submit a text, SoSOL records it; when you submit a text or propose an emendation SoSOL will not let you submit until you have written a message explaining what you propose. Similarly, SoSOL will not allow Editors to vote on a text without explaining why they vote the way they do. For every single text SoSOL keeps a permanent and comprehensive record of every single change. Users can see this, forever. The discipline of transparency and permanence has the virtue of requiring all of us to live up to the high standards of our field's motto, and make that motto meaningful: *amicitia papyrologorum*. Collegiality is, in effect, a technical requirement of SoSOL. It also means that all proposals must be offered and scrutinized with utmost seriousness, since our comments are visible to all, forever. And, that under SoSOL accurate scholarly attribution is very easy to enforce. Moreover, we assume that even suggestions judged by the Editors to be incorrect might one day be judged right, in the light of new finds, or might, though wrong, nevertheless inspire someone else to solve even an unrelated puzzle. So, SoSOL does not throw away rejected ideas; it simply stores them in the Comments page for every text, accurately attributing and time-stamping every single comment, for posterity, and for purposes of rigorous scholarly attribution⁶⁴⁷.

One strength of this model is that rejected proposals are not deleted forever, and are instead *retained* in the digital record, in case new data or better arguments appear to support them. Additionally, all accepted proposals are attributed to their contributor so that proper scholarly credit can be given to them⁶⁴⁸.

However, the editing process takes place in the PE (SoSOL) platform ("Advanced Create" in the user's home page, after login), where one can choose between changing existing material, picking DDB, HGV or APIS entries up, or creating a completely new "publication", as the editing instance

is called⁶⁴⁹. Each “publication” is divided into “identifiers”, i.e. the constituting resources (DDB text, HGV and APIS metadata); each “publication” and each “identifier” are provided with a unique number, which forms the URI of the editing instance (e.g. http://papyri.info/editor/publications/55694/ddb_identifiers/126674/edit points to a DDBDP text editing instance within publication no. 55694)⁶⁵⁰. The process ends with the submission of the changes made by the users to an editorial board (currently composed of Rodney Ast, James Cowey, Paul Heilporn, Todd Hickey, Cisca Hoogendijk, and Josh Sosin⁶⁵¹), which conducts a thorough double peer review on the proposals and decides whether accepting, correcting, refusing, or sending them back to the user for more substantial changes. If the changes are accepted, the updated file will be eventually published in the database and publicly available, with all comments and remarks traced in the history log⁶⁵².

Texts can be edited from their XML code, but in order to facilitate the work of papyrologists, a tag-free markup language has been developed so that it be the closest possible to the traditional Leiden editorial conventions⁶⁵³. This language is therefore called Leiden+ because it is a digital enhancement of the Leiden system. It has a double advantage: it is comparatively easy to learn and use for non-XML experts, and it allows to copy and paste text from digital sources, and to adjust it with minimal changes (of course, the source text must be typed in Unicode characters). Many signs remain the same as their Leiden antecedents; others undergo little adjustments (see the summary table below) because Leiden+ markup has to be automatically transcoded into the corresponding XML tags⁶⁵⁴.

For example, abbreviated words – traditionally resolved with the expansion in parentheses – must be enclosed into an extra pair of parentheses, because also the entire word is marked as an expanded abbreviation in XML, e.g. αὐ(τός) → (αὐ(τός)) → <expan>αὐ<ex>τός</ex></expan>. It must be stressed that while Leiden+ is a descriptive markup system, i.e. it tends to reproduce the papyrological features of a text, XML is a semantic markup language, i.e. tends to describe the meaning of those features. This leads to interesting theoretical conflicts with the traditional papyrological editorial practice.

For example, a lacuna is, papyrologically speaking, a physical gap of the papyrus, where some text is missing. This is marked, according to the Leiden conventions, with square brackets. Sometimes lacunas can be supplemented, either completely or partially, on the ground of parallels or conjectures or such, but from the papyrological viewpoint they are still lacunas. There is no papyrological difference between αὐ[. . .], αὐ[το .], and αὐ[τός]: square brackets always indicate the same circumstance. TEI XML, on the other hand, being a text-focused markup, distinguishes between textual portions and non-textual portions, so that an unsupplemented lacuna (non-textual portion) remains a lacuna and is labelled with the <gap> tag. Therefore, our first

example will be encoded as αὐ[.3] and transcoded into αὐ<gap reason="lost" quantity="3" unit="character"/>, i.e. “a 3–character long gap of lost text”. On the contrary, a supplemented lacuna is encoded as supplied text, with the <supplied> tag; therefore, our third example will be transcoded into αὐ<supplied reason="lost">τὸς</supplied>. This has consequences on the Leiden+ markup, because one must be careful in separating supplemented and unsupplemented portions when they occur within the same lacuna: our second example must be encoded as αὐ[τὸ][.1] so that it be correctly transcoded into αὐ<supplied reason="lost">τὸ</supplied><gap reason="lost" quantity="1" unit="character"/>. On the other hand, what for a papyrologist represents illegible characters, expressed with dots (e.g. αὐ . . .) but not in square brackets because actually visible on the papyrus, for XML is a non-textual portion, since it does not express any meaningful text, and is classified as a <gap>. The only difference from a proper lacuna is the “reason” attribute, “illegible” instead of “lost”: αὐ<gap reason="illegible" quantity="3" unit="character"/>, i.e. “a 3–character long gap of illegible text”.

Another important caveat is that Leiden+, as all markup languages, though tag-free, is nonetheless a mathematical expression and its logical syntax must be respected. Therefore, if a papyrologist has to transcribe a lost line end, (s)he can print an opening square bracket followed by a blank; but in the digital encoding, (s)he must close the bracket, because any opened tag must be closed properly: αὐτὸς [→ αὐτὸς [.?]. Syntax mistakes are always noticed by a validation checker, which will display a red banner when the editor attempts to save the work; on the contrary, the platform cannot detect semantic errors, like the said lacuna case, and it will display a green banner anyway when saving⁶⁵⁵.

This kind of markup causes elements of the apparatus criticus to be encoded directly within the text: the terms that need to be pinpointed in the apparatus are marked through special tags, and their display at the bottom of the text is just a matter of HTML visualization, admittedly to emulate a printed edition (see above, § 8.4). This is probably the best and clearest example of the fact that such a semantic markup as XML / Leiden+ is content-focused rather than display-focused, which means that what really matters is the correct encoding of the textual features, their semantic substance, and not their rendered appearance:

there is much emphasis in the modern study of digital preservation on preserving the appearance of documents [...]. But an overemphasis on appearance pushes one in the direction of technologies that I will argue are not the ideal vehicles for digital preservation⁶⁵⁶.

A closer look at the apparatus cases considered by the papyrological XML / Leiden+ markup seems to be worthwhile, since it is the main milestone that differentiates purely textual databanks like TLG from proper digital editions⁶⁵⁷. All tags work the same way in Leiden+: the opening mark <: is

followed by the ‘correct’ or main instance of the text (the preferred alternative to be printed in the text; the newer reading; the regularized or corrected form), then by the appropriate tag, finally by the other instance or instances (multiple alternatives and editorial corrections are supported), before the closing mark `>`. However, the HTML rendering can differ: usually the term on the left is displayed in the main text, but the `|reg|` tag works the other way around, as noted above (§ 8.4). Furthermore, the EpiDoc XML code behind Leiden+ points to slightly different concepts: alternatives and editorial corrections belong to the `<app>` type, expressing “one entry in a critical apparatus, with an optional lemma and usually one or more readings or notes on the relevant passage”⁶⁵⁸; regularizations and orthographic corrections belongs to the `<choice>` type, defining a number of alternative encodings of the same text portion due to editorial interventions⁶⁵⁹; the scribal correction, `<subst>`, points to ancient interventions, which belongs to a third different category because records actual text features and not modern editorial changes⁶⁶⁰.

The following examples are taken from the online guidelines, http://papyri.info/docs/leiden_plus:

Case	Description	EpiDoc XML	Leiden+	Output
Alternate readings	different possible readings of uncertain words	<code><app type="alternative"> <lem>Ὀχυρρυγίτου</lem> <rdg>Ὀξυρρυγίτου νομοῦ</rdg> </app></code>	<code><:Ὀχυρρυγίτου alt Ὀξυρρυγίτου νομοῦ:></code>	Text: Ὀχυρρυγίτου App: or Ὀξυρρυγίτου νομοῦ
Modern editorial corrections	newer improvements in readings proposed by the previous editors ²²	<code><app type="editorial"> <lem resp="resp">αἱ τοῦ</lem> <rdg>θίτου</rdg> </app></code>	<code><:αἱ τοῦ=resp ed θίτου:></code>	Text: αἱ τοῦ App: resp: θίτου Original ed.
Spelling regularizations	phonetic or morphological deviations from the ‘standard’ Greek ¹²⁶	<code><choice> <reg>φρόντισον</reg> <orig>φρόνδειςον</orig> </choice></code>	<code><:φρόντισον reg φρόνδειςον:></code>	Text: φρόνδειςον App: I. φρόντισον
Orthographic corrections	fixing of outright scribal mistakes ¹²⁷	<code><choice> <corr>τιμήν</corr> <sic>τμήν</sic> </choice></code>	<code><:τιμήν corr τμήν:></code>	Text: τιμήν App: τμήν παρ.
Case	Description	EpiDoc XML	Leiden+	Output
Scribal corrections	ancient text substitutions applied by the ancient scribes ¹²⁸	<code><subst> <add place="inline">τοῦ</add> <del rend="corrected">της </subst></code>	<code><:τοῦ subst της:></code>	Text: τοῦ App: corr. from της

As is apparent, the HTML display is just a temporary display of a user-

friendly adaptation (Leiden+) of a deeply semantic markup, which requires a thorough understanding of the ancient text. The traditional editorial practice is unavoidably affected by instances of uncertainty and incoherence, which should be cleared during the digital encoding of the edition, without very little care for its final graphical appearance. It has been noted, for example,

that even with standard conventions such as [printed] Leiden, not all the conventions were applied evenly, as some scholars used ‘underdots’ to indicate partially preserved characters while others used them to demonstrate doubtful characters. The use of EpiDoc consequently addressed these types of issues with Leiden encoding as it was commonly practiced⁶⁶⁵: “This example illustrates the primary advantage of encoding the editions in XML. If editors wish to differ between uncertain characters and broken characters they can encode them with different tags. They can then transform both tags into under-dots if they still wish to present both instances as such or they can decide to visualize one instance, underlined and the other under-dotted to distinguish between them”⁶⁶⁶.

The carefulness required by the digitization of a papyrus text according to a strict set of standard conventions leads us to make a fundamental observation. Digitizing a papyrus edition is itself an editorial work, a philological reconsideration of the printed edition(s). To properly encode the text in a formalized structure, the digital editor is compelled to analyse the reference edition thoroughly in order to understand what the original editor meant to express, and possibly also to check any reading against the original piece or, at least, a digital reproduction of it. Moreover, a global reconsideration of the papyrus may lead to corrections or reading improvements, which can be directly annotated in the digital framework. From this viewpoint, the digital edition is an edition of an edition, but not in the (Platonic) pejorative sense: on the contrary, it increases editorial *akribeia* exponentially, becoming an intimate part of the process of scholarship, and not a mere supporting tool:

il modello editoriale digitale [...] è rigido e flessibile al tempo stesso, e obbliga l’editore virtuale ad adeguare ai parametri condivisi del sistema le idiosincrasie sempre più marcate dei moderni editori di papiri che trascurano le raccomandazioni del sistema codificato di Leida e costruiscono edizioni critiche sempre più personali: [...] lo sforzo che l’editore virtuale fa nel convertire in linguaggio elettronico i problemi di lettura e di comprensione non risolti o la molteplicità delle soluzioni alternative educa la comunità degli esperti ad una più consapevole applicazione di criteri editoriali condivisi e di rigore interpretativo⁶⁶⁷.

Case	Leiden	LASLA	ARSINOE	DDbDP Beta Code	Leiden+	TEI/EpiDoc XML
unclear / uncertain	α	Α	. α .	α?	α	<unclear>α</unclear>
illegible (1)	.	1	.	!	.1	<gap reason="Illegible" quantity="1" unit="character"/>
illegible (15)	-15-	15		!15	.15	<gap reason="illegible" quantity="15" unit="character"/>
lacuna	[...], []	[3], []		[!3], [c%1]	[.3], [.?]	<gap reason="lost" quantity="3" unit="character"/>, <gap reason="lost" extent="unknown" unit="character"/>
supplement	[α]	[α]	(α)	[α]	[α]	<supplied reason="lost">α</supplied>
omission	(α)	<α>			<α>	<supplied reason="omitted">α</supplied>
superfluous	{α}	<<α>>			{α}	<surplus>α</surplus>
deletion	[[α]]	[[α]]		[4α]4	[[α]]	<del rend="erasure">α
interlinear	`α`	((α))			\α/	<add place="above">α</add>
abbreviation	α(β)	α(β)	α((β))	α[1β]1	(α(β))	<expan>α<ex>β</ex> </expan>
symbol	(α)	*α	((α))	[1α]1	((α))	<expan><ex>α</ex> </expan>
doubt	?	*	*		?, (?)	cert="low"
misspelling	<i>apparatus</i>		* C α = β C {4 }4, etc. * only for according scribal to types corr.		<:α reg β>, <:α corr β>	<choice><reg>α </reg><orig>β </orig></choice>, <choice><corr>α </corr><sic>β </sic></choice>

8.6 From Digital Editions to Digital Scholarship

The final, open access version of the integrated database (PN) and of the editorial SoSOL platform (PE) was released in 2010 under the name of *Papyri.info* (<http://papyri.info>). It is apparent that we are dealing with a completely different concept of papyrological database, where the instances of integration and collaboration have profoundly transformed what was originally a searching/indexing/concordancing tool⁶⁶⁸. The *Duke Databank* is no more a fixed collection of canonical reference texts: “it is a collection of

conjectures, now easily capable of being revisited, revised, and improved”⁶⁶⁹: a dynamic workspace for a digital scholarship, the true representative of a “discipline in flux”⁶⁷⁰ such as Papyrology itself, and something else than the original DDbDP.

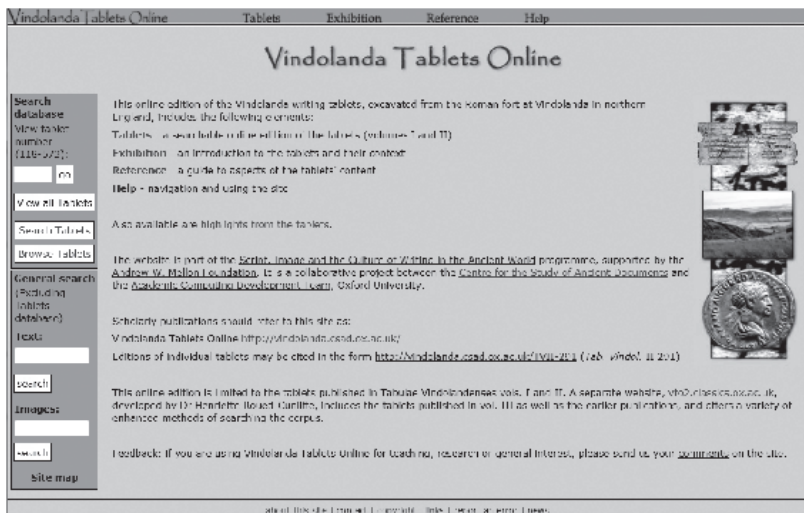
The texts, already provided with a basic critical apparatus, after the third phase of the IDP project (2010–12) are equipped with the possibility of adding an introduction and line-by-line commentary⁶⁷¹: they are, therefore, potentially closer to the concept of digital critical edition than to that of textual databanks *à la* TLG. A recent experiment conducted at Heidelberg, during the Seminar of Digital Papyrology held by Rodney Ast, Lajos Berkes and James Cowey, led to the creation of born-digital critical editions of unpublished papyri. A group of *descripta* of the Gothenburg collection was studied and edited directly online via PE. The results – some of them are already available in the public database⁶⁷² – showed that the potentials of PE go far beyond the collection of already published texts and their open update.

There exist some other online resources providing digital editions of papyrus texts. Several of them chronologically precede the IDP project, and clearly express the feeling of expanding the then existing digital papyrus *corpus* (DDbDP via *Perseus*) by taking into consideration different textual categories (namely, paraliterary and literary papyri⁶⁷³) and/or a deeper level of information (articulated metadata, apparatus criticus, descriptions and commentaries⁶⁷⁴).

A groundbreaking effort came from the already mentioned *Catalogue of Paraliterary Papyri* (2003), which beside metadata chose to provide the full texts of the documents, both in plain Beta Code (transcriptions without accents, diacriticals, papyrological signs, only to facilitate search) and in Unicode Greek, encoded in TEI XML, converted in an HTML display, and provided with a critical apparatus. Yet CPP is not a mere reproduction of the existing editions:

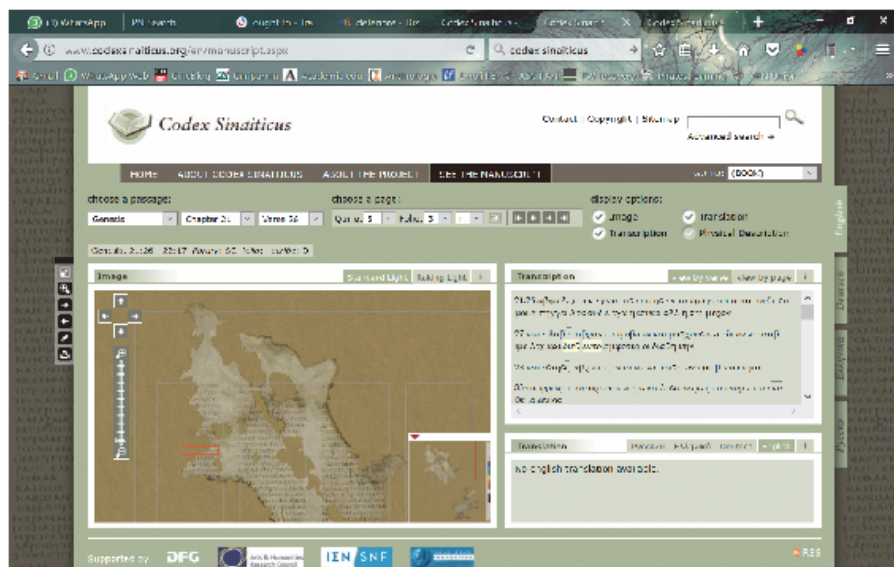
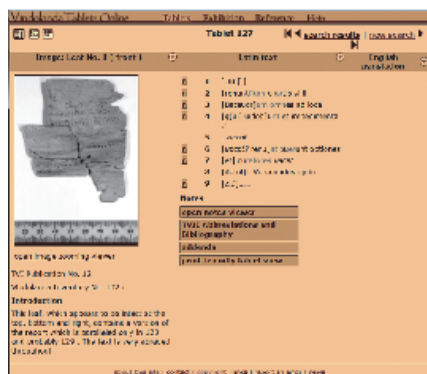
Although the CPP collection does not have the ambition to produce new scholarly editions, the texts are never simple reproductions of one particular edition but they are based on our own representation of the most recent edition or simply of the one we considered the best. In many cases, it is the result of the comparison between two or more editions. When this is so, variants among the different editions are noted in the apparatus. For the purposes of scholarly research, however, consultation of the printed editions remains necessary⁶⁷⁵.

This statement is remarkable for two reasons: first, it demonstrates what we noticed above of the philological flavour of the digitizing task; second, the recurring observation that a digital resource, even detailed and almost complete, never replaces other traditional sources of information.



Another pioneer in the digital edition of papyrological texts has been the *Vindolanda Tablets Online* portal (VTO, <http://vindolanda.csad.ox.ac.uk>), directed by Alan Bowman, Charles Crowther, and John Pearce (Oxford/CSAD), offering a complete and updated online version of T.Vindol. II, which superseded T.Vindol. I. This is a nice example of integration between printed and digital resources: introductory parts of the volumes are reproduced, useful concordances between printed and digital documents are provided, and a detailed section of *addenda* and *corrigenda* is maintained (<http://vindolanda.csad.ox.ac.uk/tablets/TVaddenda.shtml>). General introductions to the tablets and their context (“Exhibition”), a reference section with information about the documentary context (names, military terms, numerals, dates, currency, measures), and a complete guide to the database form a wide help tool to better use and understand the published material. All sections of the site are searchable, and the database itself can be browsed by several fields (publication number, subject, category i.e. chapter headings, document type, people mentioned, places mentioned, military terms, archaeological context...) or searched with various criteria (Latin text, metadata text, publication number). The texts are published alongside a zoomable digital picture, an extensive commentary, and an English translation. The texts themselves are encoded in a modified version of TEI XML⁶⁷⁶, called “Vindolanda XSL Style Sheet”, with apparatus and notes that pop up in separate windows; the notes from T.Vindol. I and the *addenda* are also available when applicable. The VTO site was developed in 2001–2003, and since 2011 it is flanked by a second website, *Vindolanda Tablets Online II* (VTO2, <http://vto2.classics.ox.ac.uk>), developed by Henriette Roued-Cunliffe. It is not intended to be a replacement of VTO but an updated re-elaboration of the concept of digital edition. While VTO was shaped as a database, VTO2 is designed as a series of XML documents encoded in Creative Commons license according to EpiDoc standards, from which information is extracted

through a web service (APPELLO) specifically developed for this site⁶⁷⁷. The new collection, comprising T.Vindol. I-II as well as the more recent third volume T.Vindol. III, can be browsed by publication number, but is not searchable; thematic indices are provided instead. Each document exhibits image, inventory number, introduction, text, translation, and commentary. A remarkable characteristic is that the text is annotated: the words feature different colours according to their category (persons, military terms...: a “contextual encoding”⁶⁷⁸) and are lemmatized, so that by clicking each one a pop-up window gives reference of the lemma, its occurrences within the *corpus* (concordance), dictionary entries from the *Perseus Project*, and a definition taken from Thomas Cooper’s *Thesaurus Linguae Romanae et Britannicae*.



The integration between text and images is even deeper in the online edition of the *Codex Sinaiticus*, the famous 4th-century biblical codex (<http://www.codexsinaiticus.org>). Since the artefact had been dispersed among four

different institutions (British Library, National Library of Russia, St. Catherines Monastery, and Leipzig University Library), an international project has been launched to reunite the entire manuscript in digital form and make it accessible to a global audience. The *Codex Sinaiticus Project* is therefore, first of all, a remarkable case of virtual reunification of scattered pieces of the same documents, performed through digital imaging techniques⁶⁷⁹. Then these high-quality pictures⁶⁸⁰ are integrated, within a single interlinked interface, page by page, with: (a) a TEI-compliant transcription of the text, supporting either a view by physical page or by biblical verse⁶⁸¹, including all corrections; (b) modern translations in Russian, Greek, German, and English of selected passages; (c) detailed physical description of each page. The text is digitally aligned to the image (see above, § 7.1), so that clicking a word in the transcription highlights the corresponding word in the picture, and can be browsed by page or by biblical passage.

A particular *corpus* that deserved a special attention is the Herculaneum one, for the understandable peculiarities that justify the existence of a “Papirologia Ercolanese”⁶⁸². An automated indexing of the Herculaneum papyri was attempted first by Knut Kleve – after all, *Lacunology* and *Literalogy* were by-products of his work on the carbonized rolls (see above, §§ 5.4 and 7.1) – and Jan Songstad, who produced (in 1975) an *Index to Works of Philodemus* in which the lines of the papyri are numbered in a continuous series, and a concordance called *Works of Philodemus* that lists the words alphabetically giving the line number, the reference to the edition, and the context of the phrase. This was followed in 1987 by a similar *Concordance to Philodemos* and by Daniel Delattre’s attempt, in the Nineties, to digitize the Philodemian texts in a Word file, to perform queries with its ‘search’ tool⁶⁸³.

In 2002 Gianluca Del Mastro started a new enterprise: he noticed that many Epicurean texts were missing from TLG, which therefore could not be used as a valid search tool for the Herculaneum papyri; on the other hand, he also noted that the Herculaneum texts, unlike the literary works recorded in TLG, are by nature subject to constant update; it was also necessary that data from all various editions be available, in order to have the entire editorial history on hand⁶⁸⁴. He therefore launched the *Thesaurus Herculanensium Voluminum* (THV, <http://www.thvproject.it>), started in 2008 with the collaboration of Holger Essler (Würzburg University). This ongoing database (26 papyri uploaded so far) is searchable with various text combinations; each papyrus is encoded with basic metadata (catalogue number; author, work title, and volume number, with indication of the degree of certainty of the attribution; bibliographical reference to edition) and the text, with interpretations and notes to lines displayed in pop-up windows, in a hypertextual architecture resembling that of VTO2 (see above). Text is encoded, rather uncommonly, in *Super-Greek* (see above, § 8.1; the corresponding font can be downloaded from the site). The choice is explained

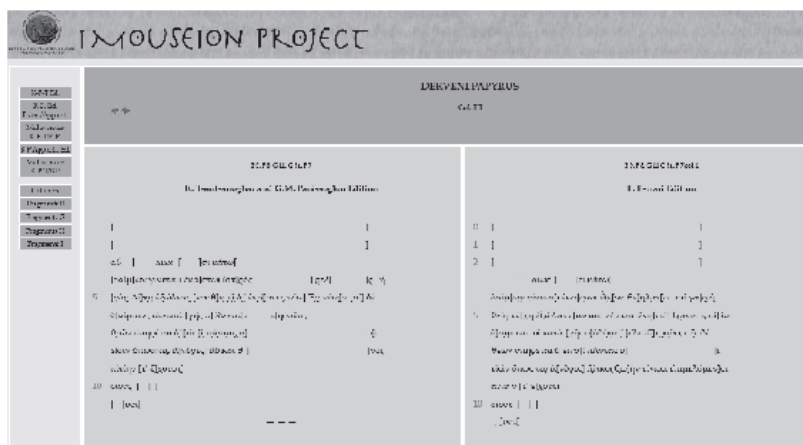
by the fact that this font contains all symbols used to edit Herculeum papyri and perfectly interfaces the programming language used to build the MySQL database. However, it goes without saying that a Unicode-compliant font would be much more universally integrated with other resources and other software: a future conversion, fortunately, is not excluded⁶⁸⁵, also in view of the ongoing project of linguistic annotation of Herculeum papyri (see above, § 7.1); THV is indeed a major contributor to DCLP (see below, § 8.7). The most interesting feature is the possibility for the registered scholarly users⁶⁸⁶ to propose emendations to the texts, in a collaborative spirit that parallels the *Papyrological Editor*, “nella convinzione, che fu di Marcello Gigante, che solo grazie alla collaborazione internazionale la papirologia ercolanese potrà continuare a lungo il suo cammino”⁶⁸⁷. Future integration with the catalogue *Chartes* (see above, § 3.6), eventually in an aggregated portal, is under consideration⁶⁸⁸. On the side of Herculeum Papyrology we shall mention also the forthcoming final outcome of PHerC project (see above, § 6.6), in that it envisages “a DVD including an interactive edition of the critical text with direct links to all the relevant papyrological documentation and a virtual reconstruction of the original papyrus roll”⁶⁸⁹: an integrated digital critical edition that raises particular expectations.

The screenshot shows the 'thvproject.it' website. The main content area contains a form for editing a papyrus text. The form is divided into several sections:

- Header:** 'thvproject.it' logo and a 'home' link.
- Form Fields:**
 - Derveni:** Luca De antrophoporphia deorum
 - Numero di Papiro:** 154
 - Autore:** Ieremias I. Ica
 - Correzione Autore:** addeve l'ed
 - Titolo:** De antrophoporphia deorum
 - Correzione Titolo:** incerto
 - Numero del Libro:**
 - Correzione del Numero del Libro:** incerto
- EDIZIONE:**
 - Editore:** V. De Falco
 - Titolo:** L. Ieremias De antrophoporphia deorum
 - Lingua/Scriptura:** Greco antico / Papirologia classica, I, Napoli 1923, 51pg
- Correzione:**
 - Pagina:**
 - Colonna:**
 - Frammento:** 1
 - Correzione:**
 - Pagina:**
 - Colonna:**
 - Frammento:** 2
 - Correzione:**
- Buttons:** 'Stampa questa pagina' and 'Ricerca'.
- Area login:** A section for user login with a text input field and a 'Login' button.
- Paguri inseriti:** A table listing papyrus fragments with columns for 'Pagina autore/ titolo' and 'Libro'.

The *Derveni Papyrus Online*, developed in 2012 by the Center for Hellenic Studies (principal editor Ioanna Papadopoulou), follows a different format, and shows some noteworthy features. The text from Kouremenos, Parássoglou and Tsantsanoglou's *editio princeps*⁶⁹⁰ is hosted on the *iMouseion Project* (<http://dp.chs.harvard.edu/index.php?col=1&ed=KPT>), a platform designed to allow annotations, indices, and collaborative work on digital editions of ancient texts⁶⁹¹. The text is encoded in content-based, annotated XML and Unicode font; the apparatus can be toggled into a different window on the right. The platform offers also a reproduction of the newer edition of the papyrus by F. Ferrari⁶⁹², with English translation and apparatus criticus. The two versions can be displayed in two parallel columns,

generating therefore a “multiversion”. The same “multiversion” can be obtained with a third edition of the text, the more recent one established by Alberto Bernabé and Valeria Piano. This is a very interesting example of the evolving nature of a digital critical edition: in a scientific background of fluidity, the hyperspace is used to store more than one version of the text, so that the possible different solutions be compared and evaluated (see below, §§ 8.7 and 9). A further feature should be stressed: thanks to the technical peculiarities of the platform, textual supplements in lacuna can be displayed or hidden at alternate clicks⁶⁹³. As we remember, the possibility of having separate outputs for the diplomatic transcription and the emended edition is an old *desideratum* in Digital Papyrology, in order to gain as much as possible a representation close to the original fragment.



A fresh ongoing project is the database to be developed in the framework of the PLATINUM project (*Papyri and Latin Texts: INsights and Updated Methodologies*) led by Maria Chiara Scappaticcio at the University of Naples “Federico II”. The project aims at providing complete editions of all Latin texts on papyrus and *ostraka*; the texts will be subsequently collected in a databank (<https://platinum-erc.it/database>, technical editor Andrea Bernini). Though most of them are already included in *Papyri.info*, the idea clearly attests to the need for some more advanced resources dealing with special *corpora*.

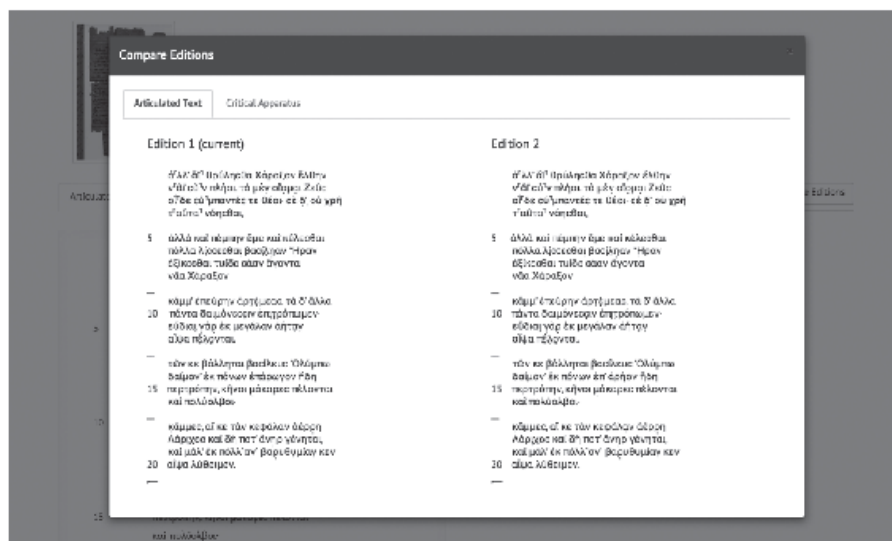
It is apparent that there is a generalized need for something more than a plain textual databank, even though with advanced search functions. A first trend is towards the creation of a collaborative workspace where papyrologists can offer their individual contribution, share knowledge, and even interact with each other in a virtual way. In short, a place for dynamic digital scholarship which seems to be the increasingly precise incarnation (or shall we say excarnation?) of the ideal *amicitia papyrologorum*, which could never find a real proper way of expression in paper format. The Internet undoubtedly

favoured this concept: as its creator Tim Berners-Lee put it,

[the Web] is an information space through which people can communicate, but communicate in a special way: communicate by sharing their knowledge in a pool. The idea was not just that it should be a big browsing medium. The idea was that everybody would be putting their ideas in, as well as taking them out⁶⁹⁴.

A second trend can be described as the deployment of an integrated and interconnected network of data, metadata and images that goes beyond the traditional fixity of canonical critical editions. A third trend is the need for resources devoted to non-documentary papyri⁶⁹⁵. The *Derveni Papyrus Online* stems from a specific research interest, but CPP and THV are admittedly aimed at filling in a DDbDP gap that even TLG cannot cover because of its own nature.

From all the said trends stemmed *Proteus*, a forthcoming Oxford project announced as “a platform that digitally captures the evolving data of Greek and Latin literary and subliterate papyri as they are edited and re-edited over time, [...] a digital ecosystem for both creating next-generation born digital critical editions and generating the textual criticism that underwrites them”⁶⁹⁶. Essentially, it is conceived as a philologically-oriented “Papyrological Editor”, where users will be able to create born online critical editions complete of diacriticals (in-browser keyboards and menus are planned to help in this) and apparatus, and to emend and update existing data. The platform is still under construction at <http://www.proteusproject.uk>, but is announced as articulated into an editorial section (DELPHI, i.e. “the Digital Editor for Classical Philology”) and the *Proteus Search Interface*.



8.7 New Standards for Digital Literary Papyri

The *Proteus* project is admittedly rooted in the statement that

[d]espite being a focal point for modern digital papyrology, the [*Papyri.info*] application targets only documentary papyri and consequently cannot be used to create born digital critical editions of literary papyri⁶⁹⁷.

It therefore aims at providing an innovative tool to perform this task by developing the encoding standards already implemented by the IDP project. The new platform will be based on a redesigned TEI-compliant XML schema, cognate to but different than the EpiDoc one that informs *Papyri.info*, since the latter was originally designed for epigraphs, and the *Proteus* developers produced “a new XML standard for philological studies of papyrological material”, which they called *Critical Syntax for Papyri* (CSYN-P)⁶⁹⁸. Consequently, the Leiden+ markup has been rethought too, and a new user-friendly annotating syntax has been developed under the name of *CSYN Markdown*, as a result of a combination between the Leiden editorial conventions “and the popular Markdown language”, which is actually a minimal transcription language for study material and ⁶⁹⁹. Moreover, “a custom XML parser” to render the XML file into HTML human-readable display will be used instead of the standard XSLT transformation schemas⁷⁰⁰. The announced innovations are great, especially after almost ten years of EpiDoc/Leiden+ addiction. What may strike is that, at least for now, no reference is made to data circulation, open-source software or Creative Commons licenses, nor to the possible compatibility of the new standards with all existing resources, nor even to cross-resource integration. Even more striking is perhaps the assertion that “the current information model for Greek and Latin digital texts fails to include the vital components necessary to create complete born digital critical editions and facilitate the scholarly use and citation of such editions”⁷⁰¹, while, as we saw above (§ 8.6), the SoSOL *Papyrological Editor* is fully equipped for supporting both live emendations and born-digital critical editions of papyri, citation of which is made rather easy by the unique identifying URLs associated to the digital documents. They are papyri of documentary type, of course: but recently a new project have been launched to extend the experience of *Papyri.info* to literary and paraliterary material – a fact that is somehow acknowledged by the *Proteus* developers⁷⁰².

The project in question is the *Digital Corpus of Literary Papyri* (DCLP, <http://litpap.info>)⁷⁰³, and has been launched in 2013 by the Institute for the Study of the Ancient World (ISAW) at New York (Roger S. Bagnall, Tom Elliott) and the Heidelberg Institute of Papyrology (Rodney Ast, James Cowey), with technical collaboration of the Duke Collaboratory for Classics

Computing (DC3), which manages *Papyri.info* (Ryan Baumann, Hugh Cayless, Josh Sosin), expressly to extend the PN/PE functionalities to the whole world of literary and paraliterary papyri⁷⁰⁴. The main coordinates of this still ongoing effort are the very same as the documentary *Papyri.info*: a *Papyrological Navigator* with the same searching options (currently from *litpap.info* it is possible to search in both *corpora*: documentary and literary); metadata (taken from TM and LDAB, of course, rather than from HGV); an *Editor* section; a TEI/EpiDOC-based XML source code publicly available via *GitHub*. The difference, and the main issue, lied in adapting the encoding parameters established for the documentary papyri to texts that present slightly different features.

As we have already cleared (see above, § 8.5), in the digital encoding of any text what really matters is the information stored in the computer, not the pure display output. Therefore, it is true that *Papyri.info* initially did not support the full set of paratextual symbols that one can find in non-documentary papyri (*coronides*, *diplai*, *diplai obelismenai*, *stigmai*, etc.), but is also true that EpiDoc XML is flexible enough to allow extending its capabilities far beyond the original design. For example, the EpiDoc tag <g> is used to label non-standard characters or glyphs (with a “type” attribute specifying the name of the symbol), and is extensively used in the Duke Databank to mark, e.g., original dots (<g type="dot"/>), S-shaped symbols for *etous* “year” (<g type="s-etous"/>), check marks (<g type="check"/>). These are all rendered in Leiden+ as the symbol name between two asterisks: *dot*, *s-etous*, *check*, etc. Of course, literary diacritical marks are not included in list of <g> types used for documentary papyri⁷⁰⁵; nevertheless, the language is flexible enough to allow using the same syntax for virtually any glyph: this means that new tags <g type="coronis"/>, <g type="diple"/>, <g type="diple-obelismene"/> and so on can implemented, and they indeed are recognized and accepted by the system. This works also on the Leiden+ side: *coronis*, *diple*, *diple-obelismene*, etc. are accepted by the PE and correctly converted in the corresponding XML. The only “problem” is that they don’t have a specific graphical display in the HTML output – but this is an issue shared with many other ‘documentary’ <g> types, also due to the lack of specific Unicode characters, and a secondary one, since the important point, as we stated, is correct encoding.

Another example of the flexibility of EpiDoc/TEI XML is the treatment of layout features. In text of literary and paraliterary nature, even more than in ‘documents’, the *mise en page* is a fundamental part of the text itself, and quite often plays a primary role: the articulation of the content bears meaning and needs to be encoded properly. *Ekthesis* and *eisthesis*, for example (extension and indentation of lines), are not only significant from the bibliological and palaeographical viewpoints, but are themselves parts of the work, contribute to its meaning in defining sections of text. Originally not conceived for the encoding of documentary papyri, such layout devices can

now be marked through appropriate XML and Leiden+ tags⁷⁰⁶.

Discussion of literary and paraliterary text encoding has been carried on by the DCLP developers together with the participating projects, in particular the Würzburg team directed by Holger Essler and the Parma team led by Isabella Andorlini. Indeed, both were dealing with very peculiar groups of texts – the philosophical treatises preserved in the Herculaneum carbonized rolls, with their fundamental and complex editorial history (see above, §§ 7.1 and 8.6), and the *corpus* of the Greek medical papyri, which comprises literary as well as documentary and paraliterary works, i.e. technical texts with a very peculiar textual scenario (reuse, annotations, abbreviations and symbols, heavy paratextual devices, idiosyncratic variants from the medical writers⁷⁰⁷). Several joint meetings led to the definition of a complex stylesheet for the encoding of ancient punctuation, diacriticals, symbols, layout devices, editorial features, not least the variant readings, which express *loci* where the papyrus deviates from the manuscript tradition or other sources and are of course totally absent from ‘documents’. Some issues are still under evaluation and development, but the *Papyrological Editor* can indeed evolve to expand the capacity of the papyrological database to encompass all the types of written materials. Both from Würzburg and from Parma came a significant contribution to the rising DCLP: the former provided annotated texts (lemmatization layer), the latter built full critical editions complete of introduction, apparatus, line-by-line commentary, and translation⁷⁰⁸. These are nice examples of the potentials of a versatile database that can become also a space of discussion and confrontation: DCLP will offer the same editing possibilities as *Papyri.info*.

The medical papyri, in particular, have been published with summarized information taken from the main reference editions, and therefore exhibit a very basic apparatus criticus and commentary, essentially reporting – beside the usual editorial corrections and ‘regularizations’ – relevant parallel passages in medical authors⁷⁰⁹. Moreover, the Parma team is also planning to develop some experimental born digital critical editions of unpublished medical papyri, in order to envisage the most suitable way to deploy the editorial workspace of DCLP. Actually DCLP, like *Papyri.info*, is not “unrelated to the task of creating born digital critical editions”⁷¹⁰ – it is just designed to be a workspace for digital scholarship, and the developments in the research will contribute to shape its nature⁷¹¹.

9The Shape of Things to Come (Not A Conclusion)

Come gather around people
Wherever you roam
And admit that the waters
Around you have grown
And accept it that soon
You'll be drenched to the bone
And if your breath to you is worth saving
Then you better start swimming or you'll sink like a stone
For the times they are a-changing...

Bob Dylan, *The Times They Are A-changing*

“The shape of things to come” was the subtitle of a conference held at the University of Virginia in March 2010, and since its proceedings⁷¹² are published under Creative Commons license, I feel free to borrow it for its strong evoking flavour. The title of that conference was “Online Humanities Scholarship”, and this is the point we reached so far: all resources we explored in their historical development and in their current shape, in their mutual interconnections and in their future expectations, concur to sketch a new model of scholarship. Boundaries have never been so blurred. If the seeming dichotomy between the two different ways of intending the papyrologist’s work – the strict definition of papyrology as philological examination and editing of texts vs “the wider use of those editions [... i.e. their] historical exploitation”⁷¹³ – had to be migrated to Digital Papyrology, then we could consider the textual databases, as well as all the work around what I called ‘virtual papyrology’, and maybe the catalogues of collections too, as representative of the former, and the comprehensive metadata catalogues *à la Trismegistos* as stemming from the latter. The tight integration of both groups in the new generation of resources massively represented by *Papyri.info* is quite significant of the rise of a new papyrological realm, which is, unavoidably, virtual, and preferably online:

Einzelideen und -projekten größere, miteinander verbundene Projekte und Tools entstehen können, die sukzessive aufeinander aufbauen und zu nützlichen und unentbehrlichen Werkzeugen werden. Anfang des 20. Jahrhunderts hätte sich Ulrich Wilcken ein derartiges Netz an Möglichkeiten wahrscheinlich nicht vorstellen können, obwohl er schon damals mit der Herausgabe des ‘Archivs für Papyrusforschung und verwandte Gebiete’ auf seine Art und Weise die WissenschaftlerInnen über die Landesgrenzen hinaus zusammenführte⁷¹⁴.

“Online Humanities Scholarship” was, in turn, borrowed by the late Isabella Andorlini as part of the title of her successful project for the creation of a digital *corpus* of the Greek medical papyri, which received a three-year Advanced Grant from the European Research Council and which is now fully merging into the ongoing DCLP (see above and below, § 8.7 and Appendix 2). It is not for narrow-minded parochialism, nor only for a due celebration of Professor Andorlini’s tragically interrupted efforts, that I persist in mentioning the Parma project, but because it has been pathbreaking, in a sense, in overcoming papyrological boundaries. In 2010, at the 26th International Congress of Papyrology in Geneva, before Josh Sosin presented the public release of the *Papyrological Editor*, Roger Bagnall (then President of the AIP) greeted the participants with a “protreptic”⁷¹⁵ talk focused on “the *amicitia papyrologorum* in a globalized world of learning”. He addressed such topics as the “willingness to share resources, to open to others and welcome them”⁷¹⁶, which substantiates into the generous sharing of online resources: catalogues of collections, first of all, but also the then very fresh collaborative endeavour of *Papyri.info*. And noticed:

One major advance that this system will make possible is the widening of the *Databank* to end its artificial restriction to documents, a category never fully defined and increasingly indefensible in an era when all of our texts have come to be recognized as artifacts of everyday writing. Isabella Andorlini realized this possibility at once and just three months ago raised the idea of entering the medical papyri using the new editor, as a kind of test project for literary texts. We are optimistic that additional functionality to support this work will be added to the editor in the coming year, and I hope that this kind of active *amicitia* will spread widely⁷¹⁷.

His words were echoed by Professor Andorlini herself, who presented the first attempts of her digital project in the following terms:

L’ipotesi di lavoro è intellettualmente, e non solo operativamente, molto ambiziosa, una vera sfida dell’*amicitia papyrologorum* adattata alle urgenze del mondo globalizzato [...], dove mettere in comune risorse (anche elettroniche) e competenze appare la sola strada davvero competitiva per la sopravvivenza degli studi classici e dei loro valori [...], con rinnovato spirito pionieristico, quello della papirologia del XXI secolo [...]⁷¹⁸.

Thus, the web-based resources finally allow gaining that longed utopia of universal integration and international collaboration in Papyrology and among the various ‘papyrologies’⁷¹⁹ – the wider sense of the *amicitia papyrologorum* – on a new, advanced level. Comparison and confrontation, as we saw, have been the primary purpose, if not the *raison d’être*, of Digital Papyrology since its very beginnings. Initially a sharing of data, then of resources, Digital Papyrology is now nurturing a sharing of knowledge. That is precisely – by the way – why largely shared standards in developing the resources are so important, as already Aristide Calderini, *mutatis mutandis*, foresaw.

I would like now to come back to Calderini himself and his methodological suggestions, just to present a quick overview of how Digital

Papyrology contributed to the fulfilment of most of his claims, following the arrangement of my previous discussion and in comparison with the achievements of ‘traditional’ Papyrology:

1)Bibliographies and Standards

- Effective bibliographical management.* Calderini praised the forthcoming *BP* and indeed it remained a fundamental instrument, now doubled by the two electronic versions (offline files and online databases).
- Standardization of papyrological abbreviations.* This is probably the most striking issue: universally shared conventions have never been achieved and the main electronic resources do utilize partially idiosyncratic abbreviations, despite the renewed online *Checklist*. Nevertheless, digital progress now offers somewhat different ways of referring to documents, and though the permanent URLs of *Papyri.info* are still affected by divergent idiosyncrasies, TM numbers gained a standardizing power, though less human-friendly than traditional *sigla*.

2)Metadata Catalogues

- General directory of documentary papyri.* This has never been fulfilled by traditional instruments, at least on the “documentary” side, on which Calderini focused (literary papyri are somehow easier to deal with, see above § 3.2, except for the elusive paraliterary category). Only computers have made it possible to collect a general, comprehensive, up-to-date repository of documentary papyri (but also of literary papyri and, with *Trismegistos*, of all types of papyri and other ancient documents as well). Partial printed catalogues did appear, but with big problems of update.
- Effective consideration of the broader context.* Comprehensive resources like *Trismegistos* (and some other thematic catalogues) helped collecting broader context information and managing it in a centralized way, with new trends of extending their interests beyond proper Papyrology.

3)Word Indexes

- Effective redaction of dictionaries (and related tools).* Many printed resources have appeared indeed (and already existed at Calderini’s date), but the main problem remains that of update. Digital tools provide an easy and quick way of coping with that⁷²⁰. Prosopographical and geographical databases have enhanced very much the fruition of printed prosopographies and geographical dictionaries: “Electronic tools will eventually supersede the main papyrological reference books”⁷²¹.

4)Imaging

-*Widespread and systematic presence of facsimile reproductions.* Seider's project of a photographic collection of dated documents (which seems the most direct heir to Calderini's and Montevicchi's outlines) evolved into HGV without producing any printed outcome. Palaeographical instruments like *PapPal* and above all the widespread practice of digital imaging and the publication of online collection catalogues have probably overcome even Calderini's more optimistic dreams⁷²², creating a network of virtual objects that contribute to reshape the concept itself of papyrological research and scholarship.

5) Mass Communication

-*Effective dissemination.* Almost needless to say is how much digital communications improved dissemination of papyrological studies among both academics and laymen, certainly more than 'traditional' ways of diffusion. Crowdsourcing projects like *Ancient Lives* made dissemination interactive, which is a pathbreaking development of the issue.

6) Textual Databases and Digital Editions

-*A unique and common papyrological corpus.* Never achieved in print but for limited types of documents (with the usual updating problems: see above, § 8), this *corpus* could be built only thanks to digital resources, and is still maintained and updated the same way⁷²³. Literary papyri are now following the same pathway.

-*A standard method of editing papyri.* The Leiden conventions did much, as Calderini admitted, but "tale intesa non esaurisce affatto il compito assai più complesso e vario di un accordo che ogni giorno più appare necessario ed urgente"⁷²⁴. He broadened the discourse to editorial formats and layouts. Now, the electronic *corpus* does follow standard and uniform conventions as regards not only editorial markup, but also general layout and format. I observed how strict computational encoding is: it forces digital editors to follow standard guidelines, whether one deals with the digitization of published material, with revisions, or with born digital editions. On the AIP recommendations for standard guidelines stemming from the digital perspectives see above, § 1.2.

-*Effective management of corrections, revisions, and re-editions.* Calderini blamed the delays in the *BL* releases, and indeed, much later on, Bagnall strongly claimed for an electronic conversion of this fundamental reference tool⁷²⁵. Here things have been somehow slower than elsewhere, but the coming years will be decisive for the complete computerization of *BL* too. In the meantime, corrections, revisions, even re-editions are (or can be) managed and tracked effectively within the collaborative system of *Papyri.info*.

-*Standardization of 'titles', i.e. typological categories of documents.* This

is still largely a *desideratum*, with neither HGV nor TM adopting strict and shared conventions for categorizing documents. But the potentials of automated text mining for topic analysis (as supported by the eAQUA platform) made it necessary to produce a reference list of standard typologies, and probably Calderini would have appreciated this very much.

It clearly appears that the methodological contribution brought by Digital Papyrology to Papyrology is deep and substantial. In some cases, digital techniques not only provide support, but do play an (inter)active role in research, even revolutionizing Calderini's methodological outlines: just think of computer-aided treatment of images and texts, as stressed above in the appropriate chapter. The most remarkable instance is indeed the ultimate digital outcome of the *amicitia papyrologorum*, which Calderini saw as international collaboration around a centralized coordination and which is now reinterpreted in a dynamically decentralized way by the collaborative model.

Moreover, we are witnessing another, quite intriguing large-scale phenomenon. Digital Papyrology means dealing with computerized information about papyri, but this produced a dematerialization of its object of study. Papyrologists – as hinted at by Bagnall in the passage quoted above – get more and more interested in papyri as material artefacts: today the archaeological context, the writing surface, and the scribal phenomenology are as important as the very text. Yet dealing with digital information has become so common a fixed habit that perhaps most of them do not notice that very often they deal with *virtual representations* of the physical object rather than its material substance. This is of course an advanced opportunity: digital pictures can be scaled, manipulated, enhanced, restored, even modelled in three (virtual) dimensions and displayed in wavelengths that are invisible to human eyes. Context or paratext information, usually implicitly contained in the very object, are objectified and expressed as separate entities (metadata) in the fields of catalogues and databases, or embedded within the very text (annotation). Texts themselves are dissolved in their digital encoding. In an age of fashionable superheroes, papyrologists are endowed with superpowers to face their supervillain, the overwhelming papyrus data⁷²⁶: more and more sophisticated and automated instruments to query and analyse texts, even to reconstruct them, and to put them in correlation with contexts and metadata. The papyrological workflow itself is being cloned by computerized routines: the automated processes for virtual restorations, for querying texts, for reconstructing lost fragments are themselves digital reproductions of the methodologies utilized by “the papyrologist at work”⁷²⁷.

These are undoubted advantages. Nonetheless, the bottom line remains that Digital Papyrology deals with *digital* papyri. Electronic images are graphical *avatars* of the physical papyri, and digital networks of data and

metadata are the virtual transcoding of the real texts: both are puzzles of pixels that tend to reproduce reality in a virtual world, where there is scope for doing enhanced research. Overcoming a somewhat old-fashioned concept of textual database as a mere store of textual strings, digital editions themselves tend to reproduce an augmented reality, by developing ways for aligning text to image, for displaying the diplomatic format of the papyrus, for interconnecting metadata. Consequently, texts themselves change into **meta-texts**, in the terms already envisaged by Traianos Gagos as early as 1998: “In this new era of papyrological research, we cannot speak of a collection of papyri alone, but also of a collection of electronic files, data, metadata and digital images”⁷²⁸. It may be worth quoting him in full, from a section of his contribution that introduces the new notion of “meta-text”:

The availability of huge amounts of information in fully searchable textual form with accompanying images through these new media is altering drastically the definition of what constitutes a ‘text’, the way we experience reading it and, ultimately, the plurality of messages a text can offer to one or more readers. The new methods of presenting text with marked up images and the simultaneous availability of a variety of other research tools within the same electronic environment give us new ways of visualizing and approaching a given text. An edited text is no more a static, isolated object, but a growing and changeable amalgam: the image allows the user to look critically at the ‘established’ text and to challenge continuously the authoritative readings and interpretation of its first or subsequent editors.

Furthermore, the simultaneous access to and study of thousands of texts and their images that could be as far apart as a millennium, in a single search and through the same medium, has the potential to challenge our established notions of the ‘messages’ a text carries within itself, its textuality and intertextuality [...]. As Roland Barthes [*sic*] explains: ‘Any text is an intertext; other texts are present in it, at varying levels, in more or less recognizable forms: the texts of the previous and surrounding cultures. Any text is a new tissue of past citations. Bits of codes, formulae, rhythmic models, fragments of social languages, etc. pass into the text and are redistributed within it, for there is always language before and around the text’⁷²⁹. In one or another way, papyrologists have always recognized the “intertextuality” of the Greek papyri from Egypt, because of the multicultural and multi-ethnic environment in which these texts were born. The development of the new electronic media in our field and the capability to establish these cross-links – or these intertextual signifiers, so to speak – on the linguistic, cultural and historical level through the interaction of multiple texts, images and a variety of related tools places the notions of textuality, intertextuality and metatextuality on a new (electronic) platform which, in turn, becomes part of these notions as the ‘carrier’, ‘interpreter’ and ‘distributor’ of these texts⁷³⁰.

Gagos’ words conceal a basic consideration: the new electronic medium *does form an integral part* of this new papyrological scholarship. This may scare quite a few people, afraid of the limits of technological resources and the risks of relying exclusively on them. Instances of reliability and trustworthiness, and praises for the reassuring materiality of printed material⁷³¹, are very often raised, in the threatening shade of the “mostro di Irvine”, ‘Irvine’s monster’, as Enzo Degani notoriously called TLG in an evergreen contribution that pinpointed the main limits of electronic databanks⁷³². It goes without saying

that crying monster must be a way of warning against excesses, or of encouraging to improve the tools, not of totally distrusting technology as a whole. We are (or should be) all aware of the limits of current databases: Willis and Oates themselves were, as is proved by their careful disclaimers that the *Duke Databank* was not designed to replace printed editions. From this standpoint, electronic resources are necessarily to be considered as mere *Hilfsmittel* for “traditional” Papyrology; a great advantage in terms of speed and convenience, but for exhaustive and complete reference one is always redirected to paper tools and human skills:

les machines peuvent aider les spécialistes dans leurs recherches en leur fournissant rapidement des données sûres ; elles sont incapables de résoudre les vrais problèmes. Il faut encore d'excellents papyrologues⁷³³.

We want to stress that we do not in the least expect that some time the scholar shall be replaced by the computer. On the contrary, as far as we can see, what now happens is that the scholar gets access to new aids and has been freed from many unnecessary burdens. He has, one could say, got a sort of magic lexicon in addition to the traditional reference books. In this magic lexicon there are endless possibilities of sorting and arranging text material in a minimum of time. But no other than the scholar is able to *use* that lexicon. Wilhelm Crönert once emphasized that there are three cardinal virtues for the papyrologist: *Sehkraft, Sprachgefühl, Sachkunde*. These virtues are today as relevant as ever they were, and can never be replaced by any computer⁷³⁴.

Accordingly, as to scientific validity, or reliability, I think that everyone should agree that it does not depend on the supporting media, but on the credibility of the editors/developers. Shortcomings and inconsistencies are immanent in the human world, and we do find them equally distributed between electronic and printed resources⁷³⁵. There are certain fields in which computational procedures need to be taken with extreme carefulness and critical discretion, like quantitative analyses of statistical data. But even a seemingly simple task such as ‘fragment siting’, the search for attested parallels of the text fragments in papyri (see above, §§ 5.4 and 7.1), whether manually performed against electronic databank or automatically processed by querying algorithms, must be handled with caution. I think the warning expressed by Mario Capasso in the final paragraph of his Introduction to Papyrology (“del cattivo uso del computer”) very remarkable: one should not force the results to site a fragment at any cost⁷³⁶. However, as it is clear, after all the responsibility falls into the *use* of the machine, in methodological terms, not in the machine itself. On the other hand, also thanks to the new collaborative platforms, digital resources can very often prove much more updated, and therefore correct, than the printed ones: think only of the increasing number of original emendations directly published online only, via PE, which are not to be found in any printed resource. Electronic tools, in conclusion, are not substitutes nor evil twins of more ‘traditional’ *instrumenta*, but just different companions.

Coming back to Gagos’ words, they conceal another fundamental point.

It is clear that these media, when used within a wider intellectual perspective as a cognitive tool for research and instruction and not only as a pragmatic medium that can ‘do certain things for us’, can challenge and redefine notions of ‘text’ and textuality. Needless to say, although computers indeed challenge the idea of the ‘authority’ of the editor, they do create at the same time a new much more complex form of ‘authority’⁷³⁷.

The concept that Digital Papyrology redefines the notion of ‘text’ is embedded in the consideration that electronic technologies offer a completely new room to scholarly research. Let us think it like walking on the Moon: a total change of environmental parameters subverts all rules known before. The digital space does totally change scholarly parameters⁷³⁸. We do not deal with texts any more: we deal with meta-texts, hypertexts, multi-layer annotated texts enriched by metadata, whether outer (i.e. the connected fields of information) or inner (i.e. any kind of textual tagging), and deploying embedded apparatuses; with virtual entities that are subject to quick – which does not mean arbitrary – updates, to a constant renovation, to a continuous scholarly labour, as the protean metaphor sketched at Oxford (see above, §§ 8.6–7, and below) iconically depicts. Thence, an unavoidable fact: “We need to move in the direction of digitally conceived and initiated types of information and away from mopping up information from print sources”⁷³⁹.

In defining what is ‘data’ for humanists (for papyrologists, ‘data’ comprises the papyrological information network of text, object and context), Trevor Owens has recently argued that they are at the same time constructed artefacts, being created by people, and interpretable texts, and they “can hold the same potential evidentiary value as any other kind of artifacts”⁷⁴⁰. We have, therefore, sets of digital papyrological data that can *themselves* bear the same scientific value as real papyrological artefacts and that circulate in an enhanced environment that dissolves the plain concept of ‘text’ in a metatextual kaleidoscope. This suggests that perhaps we should completely revise the sense, the methodology, the epistemology of Digital Papyrology. Papyrology, in its more essential core, is all about providing trustable critical editions (and discussions) of papyrus texts. It is intimately a philological discipline⁷⁴¹, though projected towards the historical (in its broader meaning) evaluation of the textual data. At any rate, no one can deny that without texts there would exist no Papyrology. Yet it is a very peculiar philological discipline, since it is well aware of the fluidity of its objects of study⁷⁴²: texts are continuously published, updated, collected, revised, corrected, emended, and there is hunger for resources that can help handling an overwhelming amount of primary data. The online environment is the most suitable place to set this ‘liquid’ philology⁷⁴³, and collaborative platforms are (to date) the most suitable incarnation of this concept⁷⁴⁴. A nice description of this is given by the *Proteus* project web page:

Why Proteus? In Greek mythology Proteus was known to change shape in order to elude capture; only to those who caught him would he foretell the future. Literary and subliterate fragments, due to constant re-editing, also continue to change shape over time.

The proposed solution, however, looks like a passive adaptation to an existing situation: the mutability of the text has been recognized, but the “digital ecosystem” tends to mimic existing paper-based editorial practices, though transferred into an enhanced environment⁷⁴⁶. Indeed, the quoted description seems to refer mostly to modern editorial work, while the apparatus information (at least, from the preview screenshots) shows a very traditional structure. *Papyri.info* itself still owes much to printed critical editions as well: post-PN editorial interventions are recorded in a history log, and the apparatus is dynamically open to emendations, but the rest of the format is pretty traditional⁷⁴⁷. Accordingly, it is an editorial practice founded and trained on traditional, fixed, linear texts. Conversely, the ultimate (at least for now) challenge would be, in my opinion, the reshaping of the digital edition in accordance with what we highlighted above: the nature of the papyrological digital data as autonomous intellectual objects, and the possibilities offered by the electronic meta-space. There is a momentous chance to see the digital document not as the mere, more or less complete reproduction of a printed critical edition, an archetypical object expressing a scholarly viewpoint, which relegates the variant (or deviant) evidence, whether modern or ancient, in a finalized apparatus, but as a quantum particle of a fluid universe of text transmission.

In conceptualizing digital editions, there is an increasing uneasiness towards traditional textual criticism⁷⁴⁸. Representations of texts can range from the diplomatic transcription of the extant item (which was a main concern of the earliest databases, later abandoned) to a ‘hybrid’ edition that tries to save the *constitutio textus* (the restitution of a text as close as possible to the original) alongside the recording of variant readings (for example, the old-style DDbDP, with the ‘normalized’ or corrected words in the text and the ‘variant’ forms, as written on the original papyrus, adjoined with special markup). The solution adopted by *Papyri.info* – original reading in the text, normalization/correction in the apparatus – is fair as regards the rendering of the original text, but is still indebted with an editorial criticism that regards the ‘variant’ as a deviation to be normalized, not only graphically, displaying l(eg) before the “normalization”, but also semantically, using the XML <reg(ularization)> tag. While this may be fine for outright scribal mistakes (but what is a mistake?), it is somehow uncomfortable for spelling (linguistic) variants, which are increasingly regarded as important phenomenological factors rather than deviations from a theoretical norm⁷⁴⁹. When turning to literary and paraliterary papyri, the issue is even more complex, because we systematically find philological variants, and we must state whether the papyrus reading is paralleled by manuscript readings or if it represents a total innovation, or we may even find scribal variants, where the scribe himself noted two different versions of the same word⁷⁵⁰. In a traditional apparatus

format, we should decide what text to consider as ‘regular’ or ‘normal’, and what a secondary reading⁷⁵¹. This is not merely theoretical: in a digital environment, it affects the searching functions, since to date the *Papyrological Navigator* cannot perform proximity queries involving words in the apparatus.

In such small technical *corpora* as medical papyri, the circumstances are even more problematic. Because of the mainly oral transmission of medical knowledge, and the mainly practical application of such a knowledge, which needs to be adapted and modified according to contingent needs and experiences, we find that a supposed ‘archetype’ (say, a prescription) often evolves in several different declinations: quotations, commentaries, summaries, revisions, personal re-interpretations, contingent variants⁷⁵². An extremely fluid situation that somehow resembles that of Homeric poetry, for which part of the traditional criticism tends to consider impossible to reconstruct an ‘original’ text beyond an extraordinarily rich oral tradition⁷⁵³. This interpretation has been digitally translated into the *Homer Multitext Project* (HMT), a project of the Center for Hellenic Studies that aims at producing a new digital representation of the textual tradition of the Homeric poems, including papyri⁷⁵⁴. The project concept results from the statement that the Homeric textual evidence does not comply with the traditional philological view of textual variants stemming from one archetype, since a true original Homeric text never existed⁷⁵⁵: a somehow “agnostic”⁷⁵⁶ environment where all witnesses are transcribed and juxtaposed, without preference for any of them⁷⁵⁷.

There is a diffused feeling that the hypertext is challenging the *Urtext* model⁷⁵⁸, though responses differ from each other. Multitext is a “method to track multiple versions of a text across time”⁷⁵⁹. The theoretical model recently proposed by Gabriel Bodard and Juan Garcés envisages “a more holistic notion”, where the user can access “not only [...] a presentational publication layer but also by allowing access to the underlying encoding of the repository or database beneath”, a “critical edition, with sources fully incorporated, [which] would potentially provide an interactive resource that assists the user in creating virtual research environments”, and which would relieve an editor from making “any authoritative decisions that supersede all alternative readings if all possibilities can be unambiguously reconstructed from the base manuscript data”⁷⁶⁰. The model that better describes this ideal condition is probably the ontology design⁷⁶¹ described by Matteo Romanello, Monica Berti, Federico Boschetti, Alison Babeu, and Gregory Crane as a digital representation of collections of fragmentary texts⁷⁶². As the authors state, indeed,

an ontology is the most suitable solution to represent critical editions of ancient texts for two main reasons: first, we want to be able to link different kinds of resources [...] that have in common the possibility of being referred to via URIs, which is one of the principles of the Semantic Web; second, information contained in critical editions constitutes a layer of interpretation and a description of relations about texts that is important to keep clearly distinct from the texts themselves. Indeed, the use of stand-off

metadata encoded within ontology allows us to express an open-ended number of interpretations, whereas a markup-based solution would not make this possible due to obvious reasons of overlapping hierarchies⁷⁶³.

Ancient fragments, to which the proposed ontology refers, are characterized by a high level of textual complexity, in the relationships among the actual text, its critical edition (interpretation), the original source (attribution), the quoting source (witness), etc., which can parallel – *mutatis mutandis* – that of the most complex papyrological sources (medical texts, Herculaneum papyri, and so on) and can therefore easily suit even simpler cases⁷⁶⁴. The mentioned authors' baseline theoretical assumption is particularly striking:

[...] fragments do not actually exist outside of scholars' interpretations. [...] Fragments are always scholarly reconstructions and interpretations of the content and structure of lost works⁷⁶⁵.

As I pinpointed above, digital papyrus editions are precisely (also) a critical work on previous printed editions, on the scholars' preceding interpretations – a way of effectively representing conjectures without pretending they are the actual text as the ancient author wrote it. This solution would involve several annotated layers, which should register any possible textual, linguistic, and editorial stage of the document⁷⁶⁶. This deeply annotated meta-text could also be connected to parallel passages, whether in other papyri or in literature, displaying in some way the various degrees of relation among the texts (intertextuality). Another important contribution can come from the XML annotation of genetic criticism phenomena recently developed by Elena Pierazzo⁷⁶⁷: Raffaella Cribiore has recently showed how genetic criticism can be successfully applied to papyrological texts⁷⁶⁸.

All these sketches are no more than practical hints, suggestions of which ways would be convenient to travel in order to solve the editorial shortcomings described in the preceding paragraphs; I will not deal with them in details here⁷⁶⁹. For now, all I care about is to stress the theoretical, methodological, and even epistemological bottom line: the digital papyrus is a different entity than the 'traditional' papyrus, has its own ontology that can produce a completely different textual criticism, thanks to the new virtual medium where it is represented. The need of reconstructing and printing some 'canonical' text, which is ultimately connected to a paper-like way of thinking, simply dissolves in the multi-dimensional, meta-dimensional, and tabular digital space⁷⁷⁰. The digital document is no more a product of philological interpretation, but a new, enhanced *avatar* of the original document and of all its metatextual and intertextual connections and networks – all its dispositive, in foucauldian terms, or also what has recently been referred to the notion of 'multimodality'⁷⁷¹. It is a **meta-papyrus** in a new virtual materiality, fruit of a digital interpretation, and the digital critical edition positions itself, beyond the apparatus, as a further step in text transmission⁷⁷².

Where do we find, then, criticism in all of this? Of course, we do not have to think that digital editions should be uncritical as – in a sense – TLG-like textual databanks. We must recall the abovementioned concept that digital data are a product of creation. Essentially, “encoding a text is an interpretive act”⁷⁷³ by itself: and this is even truer if we consider that the encoder (the digital papyrologist) must employ as much criticism and careful discernment as possible in order to give the papyrological object its correct digital representation⁷⁷⁴. We already noticed that encoding means adapting the printed conventions to the new digital medium, following strict computational standards. Digital criticism seems to mean interpreting both the papyrological data (the object, its text, its context) and the printed critical edition(s) in order to produce a digital representation of the papyrus as a metatextual and multimodal dispositive, i.e. an interconnected and multidimensional network of text, intertexts, inner and outer metadata, image, and so on⁷⁷⁵. This provides help to ‘traditional’ Papyrology, but is also something different that – in a patently open non-conclusion – requires its own methodology and its own epistemological foundations:

[f]or us, the men and women of today, the challenge lies not in doing our predecessors’ part, but [...] in doing our very own part⁷⁷⁶.

Appendix 1. Clarysse's software

FOUR APPLICATIONS FOR APPLE MACINTOSH

by Jeroen and Willy Clarysse

GHOSTBUSTER is a database in Filemaker containing more than one thousand papyrological ghostnames with their corrections. A special field lists the different types of errors made in the course of a century of papyrological studies : confusion of individual signs (one can for instance ask : with what other letters was *alpha* confused and in what periods?), erroneous supplements, erroneous word divisions, common noun instead of proper name, etc. A useful supplement to Preisigke and Foraboschi : every hapax legomenon ought to be checked with GHOSTBUSTER before one uses it as evidence. For the next congress we hope to offer you 2000 ghostnames.



By Willy Clarysse
GhostBuster
For Use with Claris Filemaker



DateConverter
For Use with Hypercard 2.0
By Clarysse & Clarysse

DATECONVERTER is a Hypercard program converting dates of the last native pharaohs, of the Ptolemies, of the Roman and Byzantine emperors, of different eras (A.U.C., era of the martyrs, era of Oxyrhynchus, Olympiads) into modern calendar. For the Roman and Byzantine periods one can even ask what day of the week falls on a given ancient date. Both the Roman and the Egyptian calendar can be converted. Use the scroll down windows to make searching easy.

e.g. 3 Phamenoth of year 23 of Ptolemaios 2 (or simply
P 2) = 28 April 262 B.C.

e.g. pridie Nonae Aprilis of a 5th indiction under
Iustinianus = 5 April 541 or 5 april 556.

The SORTES OF ASTRAMPSYCHUS is a Hypercard program allowing you to test your own future. It contains a set of 50 questions, which are answered by different Greek and Egyptian gods. The questions are in English, but the answers are in classical Greek. Sometimes you can also see a picture of the god (only in a few cases because of the lack of space on the discette). If you do not understand the Greek answer, you can ask for a hint (in Dutch!), or for a translation of the Greek words in English. Thus the program will teach you at the same time your future, classical Greek, modern Dutch and . . . Edgar Allan Poe. If you are really desperate, you can even get the translation of the whole answer into English. But the computer does not like this and you are punished with a surprise punishment.



—By Clarysse & Clarysse
**Sortes of
Astrampsychus**
For Use with Hypercard 2.0



ZenonPresentation
For Use with Hypercard 2.0
By Clarysse & Clarysse

ZENON PRESENTATION is a short introduction in English to Zenon of Caunos and his famous archive of the third century B.C., based on the Dutch booklet by W.Clarysse and K.Vandorpe. It shows the graphic possibilities of Apple and the didactic advantages of Hypercard.

EACH APPLICATION CAN BE OBTAINED FOR 10 US DOLLARS OR 15 DM OR 50 DANISH CROWNS. For the four applications together you pay 30 DOLLARS or 45 DM or 150 Danish crowns.

Appendix 2. The DIGMEDTEXT Project

I tempi sono maturi per un approccio collettivo degli studiosi alla nuova prospettiva e per la gestione di ulteriori sfide alla ricerca di lacune da colmare, se anche l'artificiosa barriera disciplinare tra papiri documentari e letterari è sul punto d'infrangersi e l'uso parallelo di libri e documenti produrrà importanti risultati scientifici, perché si potranno collegare e studiare *dossier* coerenti sul piano della provenienza e della cronologia, e aprirà stimolanti prospettive alle ricerche sulla lingua e sui lessici specialistici.

Isabella Andorlini⁷⁷⁷

Stemming from Isabella Andorlini's life-long research interest in the Greek medical papyri⁷⁷⁸, the idea of creating a commented *corpus* of all published Graeco-Roman papyri dealing with medicine, including the due updates and the edition of unpublished pieces, started as a traditional, printed project⁷⁷⁹. At the 21st International Congress of Papyrology (Berlin, 1995), she sketched such a *corpus* as a complete compendium of the extant medical texts preserved on papyrus, on the wake of the late antique encyclopaedism:

Intorno alla metà del IV secolo della nostra era, in una fase ancora fertile della cultura letteraria greca tardoantica, i nuovi intellettuali della 'memoria selettiva' fissavano i fondamenti ideologici e le basi tecnico-metodologiche del συναγεγεῖν i prodotti della classicità nella forma 'compendiosa' di generi letterari nuovi. La prestigiosa e copiosa produzione dei classici greci della medicina, e delle discipline filosofico-scientifiche ad essa collegate, è pronta per essere liberamente compendiata, forse talvolta saccheggata, dalla nuova ed esperta arte epitomatrice degli scrittori-medici bizantini.

Sull'opportunità di procedere ad una sorta di bilancio generale della scienza medica racconta di essersi intrattenuto Oribasio, il medico personale di Giuliano, durante l'itinerario di viaggio al seguito dell'imperatore sulla rotta di Antiochia. Alla scrittura di questa enciclopedia si era accinto già durante il viaggio in Gallia (nel 361). Così, nella premessa-investitura al primo libro delle *Iatrikai synagogai*, Oribasio accenna ai principi ispiratori cui vuole attenersi: quello del 'meglio' (πάντων τῶν ἀρίστων ἱατρῶν ἀναζητήσαντά με τὰ καιριώτατα συναγεγεῖν, *Coll.* I 2 = CMG VI 1,1, p. 4,7-8 Raeder), quello del 'utile' per le finalità proprie della scienza medica (καὶ πάντα ὅσα χρησιμεύει πρὸς τὸ αὐτὸ τὸ τέλος τῆς ἱατρικῆς, rr. 8-9), quello dell'aver sempre presente ciò che può essere di 'giovanimento' alla salute di chi ne ha bisogno (χρησιμοτάτην ὑπολαμβάνων ἔσεσθαι τὴν τοιαύτην συναγωγὴν, τῶν ἐντυγχανόντων ἐτόιμωξ ἐξευρισκόντων τὸ ἐκάστοτε τοῖς δεομένοις, rr. 10–12).

Chi ha avuto modo di utilizzare, e di indagare filologicamente, i libri superstiti delle Συναγωγαὶ ἱατρικαὶ (così come quelli dei manuali Σύνοψις e Εὐπόριστα che, tradotti anche in lingua latina, ebbero una ben più larga diffusione fin dalla tarda antichità) ha

potuto verificare l'efficacia dell'articolato lavoro svolto da Oribasio e ha apprezzato l'utilità delle scelte operate sui contenuti ai fini della trasmissione dei testi.

Anche noi in qualche modo persuasi della bontà di questi propositi antichi e dell'utilità di mettere a disposizione delle opere di sintesi di testi, ci accingiamo ad una sorta di συναγωγή, quando decidiamo di realizzare una raccolta, oggi necessariamente esaustiva, di quanto direttamente si è conservato dei libri di medicina che, nel naufragio della letteratura medica antica, il tempo e gli uomini hanno già significativamente selezionato⁷⁸⁰.

Pushed by such compelling intents, she outlined the main routes of development of the project: (1) a papyrological perspective, aimed at providing reliable editions of the texts; (2) a philological-critical perspective, devoted to clarify the contribution of the medical papyri to the history of texts and authors of medical literature; (3) a historical-scientific perspective, interested in describing the acquisitions in the field of the history of ancient medical science; (4) a linguistic perspective, focused on the study of the special technical vocabulary of the medical papyri⁷⁸¹.

The project soon materialized in a couple of international workshops (*Specimina per il Corpus dei Papiri Greci di Medicina*, Florence, 28–29 March 1996; *Testi medici su papiro*, Florence, 3–4 June 2002) with the related proceedings, and just as many printed volumes of the series *Greek Medical Papyri* (with a third one in progress), forming the core of the *corpus* itself⁷⁸². The quick development of the digital tools for managing papyrus texts soon captured her attention: as we have already seen above (§ 9) she has been pathbreaking in envisaging the application of the SoSOL editing platform to literary and paraliterary texts. In 2010 she attended one of the first So-SOL training session at the Duke University (Durham, NC) and within a few years she experimented the digitization of complex documentary texts (the Ammon archive) and of the first medical papyri (the Michigan Medical Codex and a significant selection of other texts), together with her collaborators and students at the University of Parma.

At the time, digitizations took place in the *Papyrological Editor*, in a special community called “ParmaMed”, which avoided the phase of submitting the edited texts to the *Papyri.info* board; when the DCLP challenge started, the Parma medical project became one of the earliest partners to contribute content and to discuss methodologies and technical improvements (see above, § 8.7). The mass encoding of the entire medical papyrus *corpus* started in 2014 under an Advanced Grant of the European Research Council (agreement no. 339828), with a project titled “Online Humanities Scholarship: A Digital Medical Library Based on Ancient Texts” (also known with its acronym DIGMEDTEXT)⁷⁸³. The technical features and issues of such an effort have already been described above (§ 8.7); from the methodological and epistemological viewpoint, it is extremely noteworthy to highlight how the digital tools allowed for a full and enhanced fulfillment of the original research questions as outlined by Professor Andorlini as early as 1995.

To resume the aforementioned points: (1) from the papyrological perspective, the digital text stems from the comparison and the ‘collation’ of all available printed editions, thus providing the most updated and reliable version; moreover, the digital platform allows for a constant updating of the texts and provides a rigid standard for the critical editions; (2) from the philological-critical perspective, the commentaries provide the basic textual, philological and literary coordinates to frame the texts themselves and their relevance as to our knowledge of ancient literature and medical science; (3) from the historical-scientific and linguistic perspectives, the textual database is interconnected with the online lexical database of medical technical terms, *Medicalia Online* (see above, § 4.3), which provides a wide linguistic, archaeological, and historical-medical overview of the studied items. All is open-access and available online for any scholar or enthusiast of the relevant research fields, and represents a powerful resource for reconsidering, updating, improving, and enhancing the studies in papyrology and ancient medicine – just as the late antique compendiasts claimed.

Over three years, 285 medical fragments – from the shortest labels to the longest treatises – have been encoded, and most of them are already accessible through the DCLP platform (see details at <https://goo.gl/ZBbHkp>). Some significant lacks (e.g. the *Anonymus Londiniensis*, the *Ärzttekammer Nordrhein* papyri, the P.Oxy. LXXX pieces) show that the work is necessarily still in progress, also because of the live technical transformations and evolutions of the supporting infrastructures; we wish to be able (and we plan) to go on effectively, exploring further possible enhancements, like a deep linguistic annotation of the *corpus* (see above, § 7.1) and a thorough consideration of paratext and of the multifarious aspects of materiality. We would like that the *Digital Corpus of the Greek Medical Papyri* (as this challenge might be called) continue to be a groundbreaking crown jewel of Digital Papyrology.

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The papyri are cited throughout according to the abbreviations of the online *Checklist* (see above, § 2.3). In the present bibliography, beside the traditional journal abbreviations complying with *L'Année Philologique* (http://www.annee-philologique.com/files/sigles_fr.pdf), the following recurring conventions are used: DHQ = "Digital Humanities Quarterly"; LLC = "Literary and Linguistic Computing"; OLin = "Open Linguistics"; RELO = "Revue de l'Organisation Internationale pour l'Etude des Langues Anciennes par Ordinateur". All links are checked and updated to May 31, 2017.

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Indices

I. Individuals and Institutions

- Almas, B. [1](#)
- Aly, M. [1](#), [2](#)
- American Philological Association (APA) [1](#), [2](#), [3](#)
- American Society of Papyrologists (ASP) [1](#), [2](#), [3](#), [4](#), [5](#)
- Andorlini, I. v–vi, [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#)
- Arzt–Grabner, P. [1](#), [2](#), [3](#)
- Association / Fondation Égyptologique Reine Élisabeth (AERE / EGKE) [1](#), [2](#), [3](#)
- Association Internationale de Papyrologues (AIP) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#)
- Ast, R. v, [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#)
- Astori, D. v, [1](#)

- Babeu, A. [1](#)
- Bagnall, R. [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#)
- Barthes, R. [1](#)
- Bauer, G. [1](#)
- Bauman, Z. [1](#)
- Baumann, R. [1](#)
- Bay, S.M. [1](#)
- Bennett, C. [1](#)
- Bentein, K. [1](#)
- Bergau, J. v
- Berkes, L. v, [1](#), [2](#)
- Bernabé, A. [1](#)
- Bernini, A. [1](#)
- Berti, M. v, [1](#), [2](#)
- Bertozzini, F. v, [1](#)
- Bilabel, F. [1](#)
- Bingen, J. [1](#)
- Bodard [1](#), [2](#), [3](#), [4](#), [5](#)
- Bonati, I. v, [1](#)
- Bounta, S. v
- Borghesi, P. [1](#)
- Boschetti, F. [1](#)
- Botti, G. [1](#), [2](#)
- Botti, M. [1](#)
- Bowman, A.K. [1](#), [2](#), [3](#), [4](#)
- Brady, J.M. [1](#)
- Breccia, E. [1](#)

- Bresciani, E. [1](#)
- Broux, Y. [1](#), [2](#)
- Brunner, T.F. [1](#)
- Brusuelas, J. [1](#)
- Buchet, A. [1](#)
- Bukreeva, I. [1](#)
- Bülow-Jacobsen, A. [1](#), [2](#), [3](#)
- Busa, R. [1](#)
- Calderini, A. [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Capasso, M. [1](#)
- Carlig, N. [1](#), [2](#)
- Cayless, H. [1](#), [2](#), [3](#)
- Cedola, A. [1](#)
- Celano, G.G.A. [1](#)
- Center for Hellenic Studies (CHS) [1](#), [2](#), [3](#), [4](#)
- Center for the Tebtunis Papyri (CTP) [1](#), [2](#), [3](#)
- Centre de Documentation de Papyrologie Littéraire (CEDOPAL) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#)
- Centre for the Study of Ancient Documents (CSAD) [1](#), [2](#), [3](#), [4](#), [5](#)
- Centro Internazionale per lo Studio dei Papiri Ercolanesi “Marcello Gigante” (CISPE) [1](#), [2](#)
- Choat, M. [1](#)
- Clackson, S.J. [1](#)
- Clarysse, J. [1](#), [2](#), [3](#), [4](#), [5](#)
- Clarysse, W. [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#)
- Cowey, J.M.S. v. [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#)
- Crane, G. [1](#), [2](#), [3](#), [4](#)
- Cribiore, R. [1](#), [2](#)
- Cristofori, A. [1](#)
- Crönert, W. [1](#)
- Crum, W.E. [1](#)
- Cuvigny, H. [1](#)
- Cuypers, M. [1](#)
- Daix, D.-A. [1](#)
- Damiani, V. [1](#)
- Daris, S. [1](#)
- Degani, E. [1](#)
- De Haro Saechez, M. [1](#), [2](#)
- Deknadt, A. [1](#)
- Delatte, L. [1](#), [2](#), [3](#)
- Delattre, A. [1](#), [2](#), [3](#), [4](#)
- Delattre, D. [1](#)
- Del Corso, L. [1](#), [2](#), [3](#)
- Del Mastro, G. [1](#), [2](#)
- De Luca, C.D. [1](#)
- Depauw, M. [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Dideren, J.-C. [1](#)
- Dogaer, N. [1](#)
- Duke Collaboratory for Classics Computing (DC3) [1](#)
- Elliott, T. [1](#), [2](#)
- Erichsen, W. [1](#)

- Erler, M. 1
- Essler, H. 1, 2, 3, 4
- Evrard, E. 1
- Evrard 1 2
- Eyckmans, C. 1
- Ferrari, F. 1
- Foraboschi, D. 1
- Fournet, J.–L. 1
- Fusi, D. 1
- Gad, U. 1
- Gagos, T. 1, 2, 3, 4, 5, 6
- Gagos, T. 1
- Garcés, J. 1
- Gascou, J. 1
- Gaudard, F. 1
- Geißel, P. v
- Genette, G. 1, 2
- Gerhardt, M. 1
- Gigante, M. 1, 2, 3
- Glickman, R.J 1
- Gonis 1, 2
- Gonis 1
- Grenfell, B.P. 1
- Grieshaber, F. 1
- Hagedorn, D. 1, 2, 3, 4, 5, 6
- Hagel, S. 1
- Hanson, A.E. 1, 2, 3
- Hanson, K.C. 1
- Hasitzka, M. 1
- Hauben, H. 1
- Heilporn, P. 1, 2, 3, 4
- Henriksson, E. 1
- Heslin, P.J. 1
- Hickey, T.M. 1
- Hoffmann, F. 1
- Hombert, M. 1, 2, 3, 4
- Hoogendijk, F.A.J. 1, 2, 3, 4
- Hugot, C. 1
- Hunt, A.S. 1
- Huys, M. 1
- Institute for the Study of the Ancient World (ISAW) 1, 2
- Instone–Brewer, D. 1
- Istasse, N. 1
- Johnson, J. 1, 2
- Johnson, W.A. 1, 2, 3
- Jones, B. 1
- Jones, M. 1
- Jördens, A. v, 1, 2

- Kaplony, A. [1](#)
- Keenan, J.G. [1](#)
- Kleve, K. [1](#), [2](#), [3](#), [4](#), [5](#)
- Koemoth, P. [1](#)
- Koenen, L. [1](#)
- Korte, J. [1](#)
- Kouremenos, T. [1](#)
- Kraft, R. [1](#), [2](#), [3](#)
- Kühn, C.A. [1](#)
- Laboratoire d'Analyse Statistique des Langues Anciennes (LASLA) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#)
- Lancellotti, M.G. [1](#)
- Leitz, C. [1](#)
- Lenger, M.–T. [1](#)
- Levison, M. [1](#)
- Lippert, S. [1](#)
- Litinas, N. [1](#)
- Longo Auricchio, F. [1](#)
- López García, A. [1](#)
- Luiselli, R. [1](#)
- London, J. [1](#), [2](#)
- Maderna–Sieben, C. [1](#)
- Magnani, M. [1](#)
- Maltomini, F. [1](#)
- Mara, H. [1](#)
- Maravela, A. [1](#)
- Maretti, E. [1](#), [2](#), [3](#)
- Marganne, M.–H. [1](#), [2](#), [3](#)
- Marmai, S. [v](#)
- Martin, A. [1](#), [2](#)
- Martinez, D. [1](#)
- Mascellari, R. [1](#)
- Mastronarde, D. [1](#)
- Maxwell, R. [1](#)
- Mazza, R. [1](#)
- McDonald, M. [1](#)
- McNamee, K. [1](#)
- Melaerts, H. [1](#)
- Menchetti, A. [1](#)
- Menci, G. [1](#), [2](#)
- Mertens, P. [1](#), [2](#), [3](#)
- Michaelson, S. [1](#)
- Mirizio, G. [1](#), [2](#)
- Mitteis, L. [1](#), [2](#)
- Moir, I.A. [1](#)
- Moisello, L. [1](#)
- Mommsen, T. [1](#)
- Montevicchi, O. [1](#), [2](#), [3](#), [4](#)
- Mooren, L. [1](#)
- Morgan, T. [1](#)
- Morton, A.Q. [1](#)
- Muccigrosso, J.D. [1](#)

- Mueller, K. [1](#), [2](#)
- Muñoz Delgado, L. [1](#)
- Muratore, D. [1](#)
- Nachtergaeel, G. [1](#), [2](#), [3](#)
- Naether, F. [1](#), [2](#)
- Nagy, G. [1](#), [2](#)
- Nielsen, B.E. [1](#)
- Nobbs, A.M. [1](#)
- Nocchi Macedo, G. [1](#), [2](#)
- Nodar, A. [1](#)
- Norsa, M. [1](#)
- Nurminen, A. [1](#), [2](#)
- Oates, J.F. [1](#), [2](#), [3](#), [4](#), [5](#)
- Obbink, D.D. [1](#)
- Oriental Institute, Chicago [1](#), [2](#)
- Owens, T. [1](#)
- O'Brien, A.A. [1](#), [2](#)
- O'Donnell, J. [1](#)
- Pack, R.A. [1](#), [2](#), [3](#)
- Packard, D.W. [1](#), [2](#), [3](#), [4](#), [5](#)
- Packard Humanities Institute (PHI) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Paganini, M.C.D. [1](#)
- Pantelia, M. [1](#)
- Papadopoulou, I. [1](#)
- Papathomas, A. [1](#)
- Parássoglou, G.M. [1](#)
- Parsons, P. [1](#)
- Pearce, J. [1](#)
- Peremans, W. [1](#)
- Pestman, P.W. [1](#)
- Piano, V. [1](#)
- Pierazzo, E. [1](#)
- Pintaui, R. [1](#), [2](#)
- Piquette, K. [1](#)
- Potthast, D. [1](#)
- Préaux, C. [1](#), [2](#), [3](#)
- Preisendanz, K. [1](#), [2](#)
- Preisigke, F. [1](#), [2](#), [3](#), [4](#), [5](#)
- Quenouille, N. [1](#)
- Ranocchia, G. [1](#), [2](#)
- Rathbone, D. [1](#), [2](#)
- Reiter, F. v. [1](#)
- Renard, D. [1](#)
- Riaño Rupilanchas, D. [1](#), [2](#)
- Richter, T.S. [1](#)
- Rochette, B. [1](#)
- Romanello, M. [1](#)
- Römer, C.E. [1](#)
- Roué–Cunliffe, H. [1](#)

- Ruffini, G. [1](#), [2](#), [3](#), [4](#), [5](#)
- Salomons, R.P. [1](#)
- Samuel, A.B. [1](#)
- Samuel, A.E. [1](#)
- Sanger, P. [1](#)
- Scaife, R. [1](#)
- Scappaticcio, M.C. [1](#)
- Schentuleit, M. [1](#)
- Schmidt, T. [1](#)
- Scholl, R. [1](#), [2](#), [3](#)
- Schulz, M. [1](#)
- Schutze, A. [1](#)
- Schwendner, G.W. [1](#)
- Seales, B. [1](#)
- Seider, R. [1](#), [2](#), [3](#)
- Sijpesteijn, P.M. [1](#)
- Small, J.P. [1](#)
- Songstad, J. [1](#)
- Sosin, J.D. [1](#), [2](#), [3](#), [4](#), [5](#)
- Stoa Consortium [1](#)
- Stolk, J.V. [1](#)
- Sutton, D. [1](#), [2](#)
- Tammaro, A.M. [v](#)
- Tarte, S. [1](#), [2](#), [3](#)
- Terras, M.M. [1](#)
- Thissen, H.–J. [1](#), [2](#)
- Thompson, D.J. [1](#)
- Tomsin, A. [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Torallas Tovar, S. [1](#), [2](#)
- Tsantsanoglou, K. [1](#)
- Turner, E.G. [1](#), [2](#)
- Van Beek, B. [1](#)
- Vanbeselaere, S. [1](#)
- Vandoni, M. [1](#)
- Vendorpe, K. [1](#), [2](#), [3](#), [4](#), [5](#)
- Van Haelst, J. [1](#), [2](#)
- van Minnen, P. [1](#), [2](#), [3](#)
- Vannini, L. [1](#)
- Van 't Dack, E. [1](#)
- Verreth, H. [1](#), [2](#)
- Vierros, M. [1](#), [2](#)
- Wagner, G. [1](#)
- Wespi, F. [1](#)
- Wilcken, U. [1](#), [2](#), [3](#)
- Wilfong, T.G. [1](#)
- Willis, W.H. [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#)
- Willker, W. [1](#)
- Worp, K.A. [1](#), [2](#), [3](#), [4](#), [5](#)
- Yiftach, U. [1](#)

- Youssef–Grob, E.M. [1](#)
- Youtie, H.C. [1](#)
- Youtie, L.C. [1](#), [2](#)
- Yuen–Collingridge, R. [1](#)
- Zarri, G.P. [1](#), [2](#)

II. Digital Resources

- Aberystwyth Library, *Oxyrhynchus papyri* 1
- Accademia Fiorentina di Papirologia 1, 2, 3
- Act of the Scribe 1
- Advanced Papyrological Information System (APIS) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
- *Aegyptus* 1
- Aggregator 1
- Alexandria Docta 1
- Ancient Greek Music on Papyrus 1
- Ancient Greek Written Sources 1
- Ancient Libraries 1
- Ancient Lives (AL) 1, 2, 3, 4, 5, 6, 7, 8, 9
- Ancient World Digital Library (AWDL) 1
- Ancient World On Line (AWOL) 1
- Année Philologique (APh) 1
- Antinoupolis Papyri (P.Ant.) 1
- APIS Berkeley Database 1
- APIS UM (Michigan) 1
- APPELLO 1, 2
- Arabic Papyrology Database (APD) 1, 2
- Arabic Papyrology School 1
- Aramaic Texts from Egypt (ATE) 1, 2
- *Archiv für Papyrusforschung* (APF) 1
- *Archiv für Papyrusforschung* (APF) *Beihefte* 1
- Aristarchus portal 1, 2, 3, 4
- AristarchusX 1
- Association Egyptologique Reine Elisabeth (AERE / EGKE) 1
- Association Internationale de Papyrologues (AIP) 1, 2
- Banque des images des papyrus de l'Aphrodite byzantine (BIPAB) 1
- Bayerische Staatsbibliothek, Sammlungen: Papyri 1
- Berichtigungsliste der Griechischen Papyrusurkunden aus Ägypten (BL) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
- Berliner Papyrusdatenbank (BerlPap) 1, 2
- Bibliographie Papyrologique (BP) 1, 2, 3, 4, 5, 6, 7, 8, 9
- Bibliographie Papyrologique (BP) en ligne 1, 2
- Bibliography of P.W. Pestman 1
- Bibliotheca Classica Selecta (BCS) 1
- Bonner Papyrus-sammlung 1
- Books of Herculaneum 1
- Born-digital critical editions of papyri 1, 2, 3, 4
- Bremer Papyri 1
- British Library Collections: papyri 1
- Brussels Coptic Database (BCD) 1, 2, 3
- Bruxelles, Centre de Papyrologie et d'Epigraphie Grecque (CPEG) 1
- *Bulletin de l'Institut Français d'Archéologie Orientale* (BIFAO) 1
- Bulletin of Online Emendations to Papyri (BOEP) 1

- Cartonnage and carbonized papyri, Helsinki [1](#)
 - Catalogue of Mythographic Papyri (CMP) [1](#), [2](#)
 - Catalogue of New Testament Papyri & Codices [1](#)
 - Catalogue of Paraliterary Papyri (CPP) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#)
 - CEDOPAL bibliographies [1](#), [2](#)
 - Centre d'Études Alexandrines (CEAlex) [1](#)
 - Centre for the Study of Ancient Documents (CSAD) [1](#)
 - Centro Internazionale per lo Studio dei Papiri Ercolanesi "Marcello Gigante" (CISPE) [1](#)
 - Chapel Hill Epigraphic Text–Converter (CHET– C) [1](#)
 - Chartae Latinae Antiquiores Online [1](#)
 - Chartes [1](#), [2](#), [3](#)
 - Checklist of Arabic Documents [1](#), [2](#)
 - Checklist of Editions of Greek Papyri [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#)
 - Chester Beatty collection catalogue [1](#)
 - Chicago Demotic Dictionary (CDD) [1](#), [2](#), [3](#)
 - *Choix de papyrus documentaires : Essai de traitement automatique* [1](#)
 - *Chronique d'Égypte* (CE) [1](#)
 - Chronological Tables [1](#)
 - Claire Préaux memorial website [1](#), [2](#)
 - Codex Sinaiticus Project [1](#), [2](#), [3](#), [4](#)
 - Complete List of Greek NT Papyri [1](#)
 - Concordance to Philodemos [1](#)
 - Coptic Dictionary Online [1](#)
 - Coptic Palaeographical Database [1](#)
 - Critical Syntax (CSYN) Markdown [1](#)
 - Critical Syntax for Papyri (CSYN–P) [1](#)
 - Crum, *Coptic Dictionary* [1](#)
-
- Database and Dictionary of Greek Loanwords in Coptic (DDGLC) [1](#)
 - Database of New Literary Texts [1](#)
 - DateConverter [1](#)
 - Date Converter for Ancient Egypt [1](#)
 - Death on the Nile [1](#), [2](#), [3](#)
 - Death on the Nile Online Publications [1](#)
 - Demos [1](#)
 - Demotic and Abnormal Hieratic Texts (DAHT) [1](#), [2](#), [3](#), [4](#), [5](#)
 - Demotic Palaeographical Database Project (DPDP) [1](#)
 - Demotic Texts Published on the WWW [1](#), [2](#)
 - Demotische Wortliste (DWL) [1](#)
 - Demotistische Literaturübersicht (DemLü / DL) [1](#), [2](#), [3](#)
 - Derveni Papyrus Online [1](#), [2](#)
 - Diccionario Griego–Español (DGE) [1](#)
 - Didymus Papyrus, BYU [1](#)
 - Digital Corpus of Literary Papyrology (DCLP) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#)
 - Digital Corpus of the Greek Medical Papyri (DCGMP) [1](#), [2](#), [3](#), [4](#)
 - Digital Editor for Classical Philology (DELPHI) [1](#)
 - Digitalisierte Publikationen zu den Gießener Papyrussammlungen [1](#)
 - Digital Papyri at Houghton Library [1](#)
 - Digital Papyrology blog [1](#)
 - DIGMEDTEXT v, [1](#), [2](#), [3](#), [4](#)
 - Dime Online [1](#), [2](#)
 - Diogenes [1](#), [2](#)

- Dioscorus of Aphroditto [1](#)
- Ductus [1](#), [2](#), [3](#)
- Duke Databank of Documentary Papyri (DDBDP) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#)
- Duke Papyrus Archive (DPA) [1](#), [2](#), [3](#), [4](#), [5](#)
- eBay Image Archive [1](#)
- Egitto: gli archivi della memoria [1](#)
- Egypt Exploration Society (EES) [1](#)
- Electronic guide of the archives of Dioscorus of Aphroditto [1](#)
- Electronic Guide to the Heroninos Archive [1](#)
- Enhanced Digital Unwrapping for Conservation and Exploration (EDUCE) [1](#)
- e–Science and Ancient Documents (eSAD) [1](#), [2](#)
- Extraktion von strukturiertem Wissen aus Antiken Quellen für die Altertumswissenschaft (eAQUA) [1](#), [2](#), [3](#)
- Fayum Project [1](#), [2](#)
- Fondation Martin Bodmer [1](#), [2](#)
- Friends of Herculaneum Society [1](#), [2](#), [3](#)
- Gazetteer of Papyri in British Collections (GPBC) [1](#)
- Geographical Advanced Papyrological Information System (GAPIS) [1](#)
- Gesamtverzeichnis der griechischen Papyrusurkunden Ägyptens (HGV) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#)
- Ghostbuster [1](#), [2](#)
- Giessener Papyri– und Ostrakadatenbank [1](#)
- Giuseppe Botti memorial website [1](#)
- Glossary, Papyrus Projekt [1](#)
- Grammatically Annotated Philodemus [1](#)
- Graz Papyri [1](#)
- *Greek, Roman and Byzantine Studies* (GRBS) [1](#)
- Greek Basic Local Alignment Search Tool (Greek–BLAST) [1](#)
- GreekKeys [1](#)
- Greek Law in Roman Times (GLRT) [1](#)
- Greek Number Converter [1](#)
- Greek Papyrus Fragments from Oxyrhynchus in Glasgow University Library's Special Collections Department (MS Gen 1026) [1](#)
- Hawara Papyri (P.Hawara) [1](#)
- Heidelberg, Institut für Papyrologie [1](#)
- Heidelberger Papyrussammlung [1](#)
- Hellenistic Bibliography [1](#)
- Herculaneum papyri at the Bodleian Library (P.Herc.) [1](#)
- Herculaneum Project, BYU [1](#)
- HGV Glossary Tool [1](#)
- HGV Metadata Crosswalk [1](#)
- HGV Translation Crosswalk [1](#)
- Hieroglyphic and Hieratic Papyri (HHP) [1](#), [2](#), [3](#)
- Historical Dataninjas blog [1](#)
- Homer & the Papyri [1](#)
- Homer Multitext Project (HMT) [1](#)
- Ibycus Personal Scholarly Computer (PSC) [1](#)

- Ibycus System [1](#), [2](#), [3](#), [4](#), [5](#)
- ILIESI Digitale / Edizioni critiche [1](#)
- Index to Works of Philodemus [1](#)
- Inscriptions Grecques et Latines d'Égypte (IGLE) [1](#)
- Institut Français d'Archéologie Orientale (IFAO) [1](#)
- Integrating Digital Papyrology (IDP) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#)
- International Association for Coptic Studies (IACS) [1](#)
- International Society of Arabic Papyrology (ISAP) [1](#), [2](#)
- Isabella Andorlini memorial website [1](#)
- Istituto Papirologico "G. Vitelli" [1](#)
- *Journal of Juristic Papyrology* (JJP) [1](#)
- Judaica et Christiana [1](#)
- Katalog der Internetressourcen für die Klassische Philologie aus Berlin (KIRKE): Papyrologie [1](#)
- Kochrezepte auf Papyrus [1](#)
- Köln, Arbeitsstelle für Papyrologie, Epigraphik, Numismatik [1](#)
- Kölner Papyrussammlung [1](#), [2](#)
- KonträrlIndex (KI) [1](#)
- Lacunology [1](#), [2](#), [3](#), [4](#), [5](#)
- Lecce, Centro di Studi Papirologici [1](#)
- Lecce, Museo Papirologico [1](#)
- Leiden, Papyrologisch Instituut [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#)
- Leiden+ markup language [1](#), [2](#), [3](#), [4](#)
- Les livres dans le monde gréco-romain [1](#)
- Leuven Database of Ancient Books (LDAB) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#)
- Leuven Homepage of Papyrus Archives (LHPA) [1](#), [2](#)
- Leuven Homepage of Papyrus Collections (LHPC) [1](#)
- LEX [1](#)
- Léxico de magia y religión en los papiros mágicos griegos (LMPG) online [1](#)
- Liber Antiquus [1](#)
- Liddell–Scott–Jones (LSJ) / Middle Liddel [1](#), [2](#), [3](#)
- Lille, Institut de Papyrologie et d'Égyptologie [1](#)
- Literalogy [1](#), [2](#), [3](#), [4](#), [5](#)
- Macquarie University, Papyrology [1](#)
- Marriage & Divorce Papyri [1](#)
- Materiale Textkulturen [1](#), [2](#)
- Materiali papirologici al Museo Archeologico di Parma [1](#), [2](#)
- Medicalia Online [1](#), [2](#), [3](#)
- Medici et Medica [1](#)
- Mertens–Pack1 (M–P2) [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#)
- Michigan Papyrus Collection [1](#), [2](#), [3](#), [4](#)
- Milano, Centro di Papirologia "Achille Vogliano" [1](#)
- Muhlenberg College, papyrus catalogue [1](#)
- Multi–Spectral Imaging and the Oxyrhynchus Papyri [1](#)
- Mummy Label Database (MLD) [1](#), [2](#)
- Namen in koptischen vorwiegend dokumentarischen Texten [1](#)
- Neues Fachwörterbuch (nFWB) [1](#), [2](#)
- New Athena Unicode (NAU) [1](#)
- New Sappho blog [1](#)

- New Testament Virtual Manuscript Room (NTVMR) [1](#)
- Online Database of Papyrology [1](#)
- Onomasticon Hibiticum [1](#)
- Onomasticon Mothiticum [1](#)
- Onomasticon Oasiticum [1](#)
- Organa Papyrologica [1](#), [2](#)
- Oslo Papyri Electronic System (OPES) [1](#), [2](#)
- *Ostraka from Trimithis* [1](#)
- Oxyrhynchus: A City and Its Texts [1](#)
- Oxyrhynchus Computer Project [1](#), [2](#), [3](#)
- Oxyrhynchus Online [1](#), [2](#)
- P.Euphrate [1](#), [2](#)
- P.NYU II Index [1](#)
- Pandora [1](#)
- Papiri letterari della Biblioteca Laurenziana [1](#)
- PapyLab [1](#)
- Papy-list [1](#), [2](#)
- Papyri.info [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#), [40](#), [41](#)
- Papyri and Latin Texts: INsights and Updated Methodologies (PLATINUM) [1](#)
- Papyri and Related Materials at the University of Pennsylvania [1](#), [2](#)
- Papyri at Bridwell Library [1](#)
- Papyri aus der Sammlung Gradenwitz [1](#)
- Papyri Bononienses [1](#)
- Papyri from the Rise of Christianity in Egypt (PCE) [1](#)
- Papyri Latinae [1](#)
- Papyri On Line (POL) [1](#)
- Papyri Pages [1](#)
- *Papyrologica digitalia Lipsiensia* [1](#)
- Papyrological Editor (PE) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#)
- Papyrological Navigator (PN) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#)
- Papyrology / Palaeography (PapPal) [1](#), [2](#)
- Papyrology at Oxford [1](#)
- Papyrology Home Page [1](#)
- Papyrology in Finland [1](#)
- *Papyrotheke* [1](#)
- Papyrus Carlsberg Collection [1](#), [2](#)
- Papyrus Collection, SAXO Institute (P.Haun.) [1](#)
- Papyrus de la bibliothèque de Genève [1](#)
- Papyrus Portal [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Papyrus Projekt [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#)
- Parma, Corso di Papirologia [1](#), [2](#)
- Pharmacopoea Aegyptia et Graeco-Aegyptia [1](#)
- PHI CD-ROM [1](#), [2](#), [3](#), [4](#), [5](#)
- Photographic Archive of Papyri in the Cairo Museum [1](#), [2](#)
- Photographic Archives of Literary Papyrology, CEDOPAL [1](#)
- Pinax (The Imaging Papyri Project) [1](#)
- Pisa, Laboratorio di Papirologia [1](#)
- PLAURonline [1](#), [2](#)
- Poorly Attested Words in Ancient Greek (PAWAG) [1](#)
- PPadonline [1](#)

- Princeton Papyri Collections [1](#)
- *Proceedings of Altertumswissenschaften in a Digital Age: Egyptology, Papyrology and Beyond* (Leipzig 2015) [1](#)
- *Proceedings of the 1th International Congress of Papyrology* [2](#), [3](#), [4](#)
- Prosopographia Ptolemaica Online (ProsPtol) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#)
- Prosopography of the Cynopolite Nome [1](#)
- Proteus [1](#), [2](#)
- Proteus Search Interface [1](#)
- PSIonline [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#)
- Ptolemaica : Une bibliographie sur l'Egypte lagide [1](#)
- Rassegna degli strumenti informatici per lo studio dell'Antichità classica: fonti papiracee [1](#)
- Reading the Papyri [1](#)
- Reception of Greek Literature [1](#), [2](#)
- Repertorio Bibliográfico de la Lexicografía Griega (RBLG) [1](#)
- Rylands Papyri Collection [1](#)
- Salzburg, Papyrologie [1](#)
- Scholia Minora in Homerum [1](#), [2](#)
- Scholia Minora in Homerum: An Alphabetical List [1](#), [2](#)
- Schøyen Collection: Papyri & Ostraca [1](#)
- Seals and Stamps [1](#)
- *Select Papyri* (Loeb) [1](#)
- Sematia [1](#), [2](#), [3](#)
- SNS Greek & Latin [1](#)
- Son of Suda On Line (SoSOL) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#)
- Sorbonne, Institut de Papyrologie [1](#), [2](#)
- Strasbourg, Institut de papyrologie & Institut d'égyptologie [1](#)
- *Studi di Egittologia e Papirologia* (SEP) [1](#)
- Subsidia Papyrologica [1](#), [2](#)
- Supplementum Magicum (Suppl.Mag.) [1](#)
- Synallagma: Greek Contracts in Context [1](#)
- Thesaurus Herculanensium Voluminum (THV) [1](#), [2](#)
- Thesaurus Linguae Graecae (TLG) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#)
- TM ID / number [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#)
- Transcoder [1](#)
- *TraPassato(e)Futuro* [1](#)
- Trier, Fach Papyrologie [1](#)
- Trierer Papyrussammlung [1](#)
- Trieste, Centro Papirologico "Medea Norsa" [1](#), [2](#)
- Trismegistos (TM) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#), [40](#), [41](#), [42](#), [43](#), [44](#), [45](#)
- Trismegistos (TM) Archives [1](#), [2](#)
- Trismegistos (TM) Authors [1](#), [2](#), [3](#)
- Trismegistos (TM) Calendar [1](#), [2](#)
- Trismegistos (TM) Collections [1](#), [2](#), [3](#)
- Trismegistos (TM) Editors [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Trismegistos (TM) Ghostnames [1](#)
- Trismegistos (TM) Latin Abbreviations [1](#)
- Trismegistos (TM) Magic [1](#), [2](#), [3](#)

- Trismegistos (TM) Networks [1](#), [2](#)
- Trismegistos (TM) People [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Trismegistos (TM) Places [1](#), [2](#), [3](#), [4](#), [5](#)
- Trismegistos (TM) Text Irregularities [1](#), [2](#)
- Trismegistos (TM) Texts [1](#), [2](#), [3](#), [4](#), [5](#)
- Trismegistos Bibliography (TM Bib) [1](#), [2](#)
- Trismegistos One-Mode Generator (TOMATOR) [1](#)
- Trismegistos Online Publications (TOP) / Special Series (TOPSS) [1](#), [2](#), [3](#), [4](#)
- Turning the Pages [1](#), [2](#)
- *Tyche. Beiträge zur Alten Geschichte, Papyrologie und Epigraphik* [1](#)
- UCL Classics: Papyrology [1](#)
- Utah, Marriott Library: Arabic Papyrus, Parchment, and Paper [1](#)
- Vindolanda Tablets Online (VTO) [1](#), [2](#)
- Vindolanda Tablets Online II (VTOII) [2](#), [3](#)
- Virtualia (Sorbonne) [1](#)
- Virtual Workspace for the Study of Ancient Documents (VWSAD) [1](#)
- Warsaw, Department of Papyrology [1](#), [2](#)
- Warsaw, Papyri in the Department of Papyrology [1](#)
- Wien, Institut für Alte Geschichte und Altertumskunde: Papyrologie und Epigraphik [1](#)
- Wien, Papyrussammlung [1](#)
- Wikipedia: Papyrology [1](#)
- Words in Progress (WiP) [1](#)
- Workshop of Papyrology and Epigraphy, Crete (ERPE) [1](#)
- Works of Philodemus [1](#)
- WörterListen (WL) [1](#), [2](#)
- XSugar [1](#)
- *Zeitschrift für Papyrologie und Epigraphik* (ZPE) [1](#)
- Zenon Presentation [1](#), [2](#)

III. Conspectus Siglorum

- AGRE = Agriculture in Graeco-Roman Egypt
- AL = Ancient Lives
- ALPHA = Alphabet Letters in Papyri Handwriting
- APD = Arabic Papyrology Database
- APIS = Advanced Papyrological Information System
- ATE = Aramaic Texts from Egypt
- BCD = Brussels Coptic Database
- BerlPap = Berliner Papyrusdatebank
- BIPAB = Banque des images des papyrus de l'Aphrodite byzantine
- BOEP = Bulletin of Online Emendations to Papyri
- BP = Bibliographie Papyrologique
- CDD = Chicago Demotic Dictionary
- CMP = Catalogue of Mythographic Papyri
- CPP = Catalogue of Paraliterary Papyri
- CSYN-P = Critical Syntax for Papyri

- DAHT = Demotic and Abnormal Hieratic Texts
- DCGMP = Digital Corpus of the Greek Medical Papyri
- DCLP = Digital Corpus of Literary Papyrology
- DDbDP = Duke Databank of Documentary Papyri
- DDGLC = Database and Dictionary of Greek Loanwords in Coptic
- DELPHI = Digital Editor for Classical Philology
- DemLü = Demotistische Literaturübersicht
- DIGMEDTEXT = Online Humanities Scholarship: A Digital Medical Library Based on Ancient Texts
- DL = Demotistische Literaturübersicht
- DPA = Duke Papyrus Archive
- DPDP = Demotic Palaeographical Database Project
- DWL = Demotische Wortliste
- EDUCE = Enhanced Digital Unwrapping for Conservation and Exploration
- eAQUA = Extraktion von strukturiertem Wissen aus Antiken Quellen für die Altertumswissenschaft
- eSAD = e-Science and Ancient Documents
- GAPIS = Geographical Advanced Papyrological Information System
- GLRT = Greek Law in Roman Times
- GPBC = Gazetteer of Papyri in British Collections
- Greek-BLAST = Greek Basic Local Alignment Search Tool
- HGV = Heidelberger Gesamtverzeichnis
- HHP = Hieroglyphic and Hieratic Papyri
- IGLE = Inscriptions Grecques et Latines d’Egypte
- IDP = Integrating Digital Papyrology
- KI = KonträrlIndex
- LDAB = Leuven Database of Ancient Books
- LHPA = Leuven Homepage of Papyrus Archives
- LHPC = Leuven Homepage of Papyrus Collections
- LMPG = Léxico de magia y religión en los papiros mágicos griegos en linea
- MLD = Mummy Label Database
- M-P³ (often MP³) = Mertens-Pack³
- NAU = New Athena Unicode
- nFWB = Neues Fachwörterbuch
- NTVMR = New Testament Virtual Manuscript Room
- OPES = Oslo Papyri Electronic System
- PapPal = Papyrology / Palaeography
- PCE = Papyri from the Rise of Christianity in Egypt
- PE = Papyrological Editor
- PLATINUM = Papyri and Latin Texts: INsights and Updated Methodologies
- PN = Papyrological Navigator
- POL = Papyri On Line
- ProsPtol = Prosopographia Ptolemaica Online
- SoSOL = Son of Suda On Line
- THV = Thesaurus Herculanensium Voluminum
- TLG = Thesaurus Linguae Graecae
- TM = Trismegistos
- TM Bib = Trismegistos Bibliography
- TOP = Trismegistos Online Publications
- TOPSS = Trismegistos Online Publications Special Series
- VTO = Vindolanda Tablets Online
- VTO2 = Vindolanda Tablets Online II
- VWSAD = Virtual Workspace for the Study of Ancient Documents

- WiP = Words in Progress
- WL = WörterListen

IV. General Keywords

Frequent terms (e.g. papyrus, text, digital, etc.) are excluded.

- 3D imaging / modelling [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#)
- Abbreviations [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#)
- *Academia.edu* [1](#)
- Access / accessing / accessibility [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#), [40](#), [41](#)
- Alignment / aligning [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Alpha Code [1](#), [2](#), [3](#)
- Amicitia papyrologorum [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#)
- Ammon papyri [1](#), [2](#), [3](#)
- Ancient Greek and Latin Dependency Treebank (AGLDT) [1](#)
- Annotation / annotating [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#)
- Apparatus [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#)
- Arabic [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#)
- Aramaic [1](#), [2](#), [3](#)
- Archetype [1](#), [2](#)
- Arethusa [1](#), [2](#)
- Artemidorus papyrus [1](#), [2](#), [3](#), [4](#)
- ASCII [1](#), [2](#), [3](#)
- Beta Code / Betacode [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#)
- Bibliography / bibliographies [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#)
- Blogs [1](#), [2](#), [3](#)
- Books [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#)
- Cameras [1](#), [2](#), [3](#), [4](#), [5](#)
- Carbonized papyri [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#)
- Catalogues / cataloguing [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#)
- Categorization [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#)
- CD(–ROM) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#)
- Center for the Tebtunis Papyri (CTP) [1](#), [2](#)
- Christian papyri [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Circulation [1](#), [2](#)
- Classics [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#)
- Collaboration [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#)
- Collaborative resources [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#),

- 18
- Collections [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#)
- Commentary [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#)
- Communication [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#)
- Comparison / comparing [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#)
- Computers / computing [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#)
- Concordances / concordancing [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#)
- Context [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#)
- Conventions [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#)
- Coptic [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#)
- Corpus / corpora [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#)
- Corrections [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#)
- Creative Commons license [1](#), [2](#), [3](#), [4](#)
- Criticism [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#)
- Crowdsourcing [1](#), [2](#)
- Daphne papyrus [1](#)
- Data [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#), [40](#), [41](#), [42](#), [43](#), [44](#), [45](#), [46](#), [47](#), [48](#), [49](#), [50](#), [51](#), [52](#), [53](#), [54](#)
- Databanks / databases [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#), [40](#), [41](#), [42](#), [43](#), [44](#), [45](#), [46](#), [47](#), [48](#), [49](#), [50](#), [51](#), [52](#), [53](#), [54](#), [55](#), [56](#), [57](#), [58](#), [59](#), [60](#), [61](#), [62](#), [63](#), [64](#), [65](#), [66](#), [67](#), [68](#)
- Datasets [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#)
- Dating [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#)
- Dead Sea Scrolls [1](#), [2](#)
- Demotic [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#)
- Derveni papyrus [1](#), [2](#)
- Diacriticals [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#)
- Dictionaries [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#)
- Dispositive [1](#), [2](#), [3](#), [4](#)
- Dissemination [1](#), [2](#), [3](#), [4](#)
- Documentary papyri [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#), [40](#), [41](#), [42](#), [43](#), [44](#), [45](#)
- DVD [1](#), [2](#), [3](#)
- eBay [1](#)
- Editions / editing [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#), [40](#), [41](#), [42](#), [43](#), [44](#), [45](#), [46](#), [47](#), [48](#), [49](#), [50](#), [51](#), [52](#), [53](#), [54](#), [55](#), [56](#), [57](#), [58](#), [59](#), [60](#), [61](#), [62](#), [63](#)
- Egyptian [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#)
- E-mails [1](#), [2](#)

- Emendations [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#)
- Encoding [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#)
- EpiDOC [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#)
- Epigraphy [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#)
- Epistemology [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#)
- *Facebook* [1](#), [2](#), [3](#)
- *FileMaker* [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#)
- Floppy disks [1](#), [2](#)
- Fonts [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#)
- Formulas / formulaic features [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#)
- Fragments [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#), [40](#), [41](#), [42](#), [43](#)

- Fragment siting [1](#), [2](#), [3](#), [4](#), [5](#)
- Genetic criticism [1](#)
- Genres [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#)
- Geography [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#)
- Geographic Information System (GIS) [1](#), [2](#)
- *Gephi* [1](#), [2](#)
- *Git / GitHub* [1](#), [2](#), [3](#), [4](#)
- Glossaries [1](#), [2](#), [3](#)
- *Google Maps* [1](#)
- Gothenburg papyri [1](#)
- Grammatical analysis / annotation [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Graphs [1](#), [666](#), [2](#), [3](#), [4](#), [5](#)
- Graphics [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#)
- *GreekKeys* [1](#)
- Handwriting [1](#), [2](#), [3](#), [4](#)
- *Hathi Trust* [1](#), [2](#)
- Herculaneum papyri [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#)
- Homeric papyri [1](#), [2](#), [3](#)
- HTML [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#)
- Humanities [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#)
- *HyperCard* [1](#), [2](#), [3](#), [4](#)
- Hypertext [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#)
- Iatromagical papyri [1](#), [2](#)
- Identifiers [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#)
- Images / imaging [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#)
- Indexes / indexing [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#), [40](#), [41](#), [42](#), [268](#), [297](#), [43](#)
- Information [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#), [40](#), [41](#), [42](#), [43](#), [44](#), [45](#), [46](#), [47](#), [48](#), [49](#), [50](#), [51](#), [52](#), [53](#), [54](#), [55](#), [56](#), [57](#), [58](#), [59](#), [60](#)
- Infrared [1](#), [2](#), [3](#)
- Integration / integrationg [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#)
- Interconnection [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#)
- Interdisciplinarity [1](#), [2](#), [3](#), [4](#), [5](#)
- *JStor* [1](#)
- Knowledge [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#)
- *LaserGreek* [1](#)
- Latin [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#)
- Layout [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Leiden conventions [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#)
- Lemmatization [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#)

- Lexica / lexicography 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
- Linearity 1, 2, 3
- Linguistics 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27
- Linguistic variation 1, 2, 3, 4, 5, 6
- Literary papyri 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42
- *Mac(intosh)* 1, 2, 3, 4, 5, 6
- Magical papyri 1, 2, 3, 4, 5
- Magnetic tapes 1, 2
- *Markdown* 1, 2, 3
- Markup 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
- Media 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
- Medical papyri 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
- Memory 1, 2, 3, 4, 5, 6, 7, 8, 9
- Metadata 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48
- Meta–papyrus 1
- Meta–text 1, 2, 3
- Methodology 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30
- Morphological analysis 1, 2, 3, 4, 5, 6, 7
- Multimodality 1
- Multispectral analysis 1, 2, 3, 4, 5, 6, 7
- Multitext 1, 2, 3, 4, 5
- Mummy labels 1, 2, 3
- *MyCoRe* 1, 2, 3
- *MySQL* 1, 2
- Mythographic papyri 1, 2, 3
- Named entities 1, 2, 3, 4, 5
- Networks 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21
- Nuclear magnetic resonance 1
- Onomastica / onomastics 1, 2, 3, 4, 5, 6
- Ontology 1, 2, 3, 4, 5
- Open Journal System (OJS) 1
- Open resources 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29
- Open access 1, 2, 3, 4, 5
- Open source 1, 2, 3, 4, 5
- Optical Character Recognition (OCR) 1, 2
- ostrakon 1
- *Ostraka* 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23
- *Oxyrhynchus* papyri 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
- Palaeography 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21

- Paper [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#)
- Paraliterary papyri [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#)
- Paratext [1](#), [2](#), [3](#), [4](#), [5](#)
- Particle-Induced X-ray Emission (PIXE) [1](#)
- PC [1](#)
- perishability [1](#)
- *Perseus* [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#)
- Petra papyri [1](#), [2](#), [3](#)
- Philology [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#)
- Photography [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#)
- Pictures [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#), [40](#), [41](#), [42](#), [43](#), [44](#), [45](#), [46](#), [47](#), [48](#), [49](#)
- *Pleiades* [1](#)
- Posidippus papyrus [1](#), [2](#)
- Print / printed resources [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#)
- Processing [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#)
- *ProQuest* [1](#)
- Prosopography [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#)
- Publishing [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#)

- Punched cards [1](#), [2](#), [3](#), [4](#)
- Quantitative analysis [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#)
- Reflectance / Reflectance Transformation Imaging (RTI) [1](#), [2](#), [3](#)
- Regular expressions [1](#)
- Regularizations [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#)
- Relational databases [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#)
- Restorations [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#)
- Reunifications [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#)
- Reuse [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Revisions [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#)
- *Sammelbuch* [1](#), [2](#), [3](#), [4](#), [5](#)
- Scholarship [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#)
- Seals [1](#), [2](#), [3](#)
- Semantic analysis / semantics [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#)
- Semi-literary papyri [1](#)
- SGML [1](#), [2](#)
- Sharing [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#)
- SIFT flow algorithm [1](#)
- Social media [1](#)
- Social Network Analysis (SNA) [1](#), [2](#), [3](#)
- SQL [1](#)
- Stamps [1](#)
- Standards / standardization [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#), [40](#)
- Storage / storing [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#)
- Stylometry [1](#)
- Stylus tablets [1](#), [2](#), [3](#), [4](#)
- Subliterary papyri [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- *Suda* [1](#)
- *SuperGreek* [1](#), [2](#), [3](#)
- Tablets [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#)
- Tabularity [1](#), [2](#), [3](#), [4](#)
- Tachygraphic papyri [1](#)
- Tags / tagging [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#)
- Text Encoding Initiative (TEI) [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#)
- Text mining [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Text transmission [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#)
- Tokenization [1](#), [2](#), [3](#), [4](#)
- Transcoding [1](#), [2](#), [3](#), [4](#), [5](#)
- Transcriptions / transcribing [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#)
- Treebanks [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- *UCINET* [1](#), [2](#)
- Ultraviolet [1](#)

- Unicode [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#)
- Unrolling / unwrapping [1](#), [2](#), [3](#)
- Update / updating [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#), [35](#), [36](#), [37](#), [38](#), [39](#)
- URL [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Variants [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#)
- Variation [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#)
- Vindolanda tablets [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- Virtual Research Environment (VRE) [1](#)
- *Wayback Machine* [1](#), [2](#)
- Web [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#), [26](#), [27](#), [28](#), [29](#), [30](#), [31](#), [32](#), [33](#), [34](#)
- wiki [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- *Wikipedia* [1](#)
- *Windows* [1](#), [2](#)
- XHTML [1](#)
- XML [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [8](#), [9](#), [10](#), [11](#), [12](#), [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), [19](#), [20](#), [21](#), [22](#), [23](#), [24](#), [25](#)
- X-ray [1](#), [2](#), [3](#), [4](#), [5](#), [6](#)
- XSLT [1](#), [2](#), [3](#)

Endnotes

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1 Cf. ANDORLINI 2008; ANDORLINI – REGGIANI 2012.

2 Cf. ANDORLINI 2017a; see below, esp. §§ 8.6–7.

3 REGGIANI 2012 represents the first outcome of my experience in this field, being the product of my involvement in a Digital Humanities seminar coordinated by Professor Anna Maria Tammaro at the University of Parma and stemming from the Digital Papyrology introductory seminars I held for Professor Andorlini’s classes.

4 An update web page is prospected at <http://www.papirologia.unipr.it/dp/update.html>.

5 BABEU 2011, 141–57; DELATTRE – HEILPORN 2014; QUENOUILLE 2016 (more Leipzig-focused). RUFFING 2000 and CAPASSO 2005, 227–35 are slightly outdated but are nice snapshots of past situations.

6 I must also anticipate that I will deal mostly with Greek and Latin Papyrology. Demotic will not be forgotten, since it constitutes a fundamental linguistic and cultural source for Graeco-Roman Egypt. Conversely, egyptological digital resources, though very promising and Egypt-related as well, will not be taken into consideration; for a recent survey of them, see WOUTER – VAN KEER 2014.

7 THOMPSON 2007, 37.

8 SMALL 1997 (cf. the review by THOMAS 2000).

9 Aeschyl. *Prom.* 789; cf. NIEDDU 1984.

10 MCGANN 2012, 1.

11 HOCKEY 2004, 3.

12 A good starting point is represented by SCHREIBMAN – SIEMENS – UNSWORTH 2004.

13 BABEU 2011, 1; cf. CRANE 2004. For historical sketches of digital classics one should primarily refer to BRUNNER 1993 and CRANE 2004; cf. also TERRAS 2010 and BABEU 2011, part. 1–7.

14 CHAMPION 1999, 133; cf. TERRAS 2010, 172–3.

15 CRANE 2004, 46; cf. also KRAMER 2004, 23.

16 For the issues raised by a concise definition of papyrology, with a particular attention for the more recent trends, see BAGNALL 2009a (quotation from p. xvii).

17 TOMSIN 1966, 205 n.1; cf. ZARRI 1967, 56. This commission was appointed on a proposal by Alan B. Samuel (Yale) after Alfred Tomsin presented the project of an automated prosopography at the 11th International Congress (Milan 1965; see below, § 3.5), and thus slightly antedates the Special Committee for Computer Problems officially charged by the American Philological Association in 1968 (cf. BRUNNER 1993, 12–13).

18 Among the many possible references, see BAGNALL – JAKUBS – SOSIN 2007, 1 (“Among humanistic fields, papyrology is notably well provided with digital resources for access to primary texts, metadata, and images of the papyri, ostraca, and tablets preserved in Greek, Latin, Arabic, various forms of ancient Egyptian, and several other languages”), but also – to give space to other official languages of the discipline – e.g. CAPASSO 2005, 227 (“Tra le varie discipline che studiano l’antichità classica la papirologia è forse quella che

prima e più di ogni altra ha compreso la grande utilità del ricorso alle risorse dell'informatica: il computer ormai fa parte degli strumenti del lavoro quotidiano del papirologo, che grazie ad esso può orientarsi con una certa facilità nell'immensa mole di confronti e di bibliografia con cui lo studio anche di un singolo papiro lo porta a doversi più o meno inevitabilmente misurare"), and QUENOUILLE 2016, 6 ("Dabei wurde das Fach Papyrologie in Bezug auf computergestützte Hilfsmittel zum Pionier unter den Geisteswissenschaften").

19 Cf. DEL CORSO 2007, 165: "La decifrazione di un papiro è innanzi tutto una ricerca di paralleli e *loci similes* e le informazioni ottenute grazie ad essa, spesso, si chiariscono a loro volta solo se è possibile inserirle in una serie di dati analoghi e riferirle a un contesto più ampio. Per questo, l'esigenza dell'inventariazione sistematica delle informazioni disponibili si è rivelata da subito, per la papirologia, ancor più pressante e vitale che per altre discipline antichistiche"; also QUENOUILLE 2016, 6.

20 On the connection of the papyrological data with a broader context see HOBSON 1988; KEENAN 1991; VAN MINNEN 1994, 36–7; BAGNALL 1995a, part. 95–7.

21 On the history of the motto see KEENAN 2009, 69. "The meaning of the motto is usually assumed but rarely defined. It is an ideal that clearly implies that the field of papyrology is larger than individual papyrologists, no matter what their several contributions. It alludes to a code of courtesy even in cases of strong disagreement [...]. It acknowledges that the field is in a constant state of growth and revision in which all papyrologists are partners. It suggests that the friendship is personal as much as professional. It also points to the internationalism of the field" (*ibid.*). On digital networks like APIS as electronic exemplifications of this "commitment to friendly scholarly symbiosis and a loyal effort to share information continuously and globally" see BAGNALL – GAGOS 2007, 65. On the digital approach as a contemporary continuation of the "collaborative nature" underlying the papyrological motto, see BABEU 2011, 141–2.

22 DELATTRE – HEILPORN 2014, 331.

23 YOUTIE 1963; cf. SCHUBERT 2009, 198: "it is now much easier for a papyrologist to sort through a vast number of papyri – tens of thousands of texts – at high speed, thus making it possible to look for parallels to a new item within a few minutes, where the same process would have required several hours not long ago"; see below, §§ 1.2 and 9.

24 HANSON 2002; see below, § 9.

25 Cf. TURNER 1973; YOUTIE 1974.

26 Cf. especially BAGNALL 1995a (quotation from p. 1). For this methodological dichotomy, see KEENAN 2009, 73 ff.

27 BAGNALL 1995a, vii; cf. CALDERINI 1936, 354–5.

28 Cf. RUPPRECHT 1994, 24–5.

29 Cf. RUPPRECHT 1994, 25; SCHUBERT 2009.

30 Cf. CALDERINI 1936, *passim*.

31 This system was established at the 18th International Congress of Orientalists (Leiden, September 1932) as a set of shared conventional marks to transcribe ancient texts (cf. VAN GRONINGEN 1932; HUNT 1932; COLLART 1933, 443–5; TURNER 1980, 70).

32 This is the main point of Calderini's subsequent interventions (CALDERINI 1951; 1956), and cf. MONTEVECCHI 1966, 47–8 as well. On Pack's catalogue see below, § 3.2.

33 Cf. also MONTEVECCHI 1966, 47.

34 As is known, and as every handbook of Papyrology explains, the editions of papyrus texts (usually those provided with word indices, indispensable to precisely record the complex vocabulary of the papyri), the *Sammelbuch* that collects and registers what is sparsely published on journals or miscellaneous volumes, the main collections of documents (among the others, Wilcken's and Mitteis' *Chrestomathie*), and some relevant series or single publications, are characterized by abbreviations facilitating the citation of them. This is a consolidated habit, not only in Papyrology; and the importance of a uniform system which could be used and understood by all the scholars worldwide needs very few explanations.

35 Cf. also MONTEVECCHI 1966, 43 ff.

36 This point is dealt with by MONTEVECCHI 1966, 41 and 42.

37 <http://www.ulb.ac.be/assoc/aip/recomman.htm>.

38 This is the backstory of a recent funny article in the “Daily Mail”: <http://www.dailymail.co.uk/sciencetech/article-3430610/Is-ancient-Greek-statue-proof-time-travel-Claims-sculpture-shows-laptop-USB-ports-point-tablet-just-one-wax.html> (see also <https://www.thecut.com/2016/02/ancient-greeks-inventors-of-laptop-holders.html>). The sculpture in question is the one reproduced below (© J. Paul Getty Museum / Open Content Program).

39 CHAMPION 1999, 135, summarizing O’DONNELL 1998, 40–63. The topic has been extensively developed by VANDENDORPE 1999, where we can follow the opposition between text linearity and text tabularity (i.e. the possibility for the reader to access visual data in a non-linear order) in more and more sophisticated information media, from the codex to the hypertext (see also below, § 9).

40 GAGOS 1996, 13; cf. CAYLESS 2010, 147, who states that in terms of screen-fitting, “we may be back to something more scroll-like”.

41 CLARYSSE – VANDORPE 2008.

42 LAMBERT – ROPIQUET 1986; cf. VANDENDORPE 1999, 189 ff. See also, e.g., the following quotation from a reference website, comparing ancient and modern writing supports: “Si usa spesso dire che oggi abbiamo ancora la possibilità di leggere i papiri di cinquemila anni fa, mentre non siamo più in grado di fare altrettanto con una lettera scritta dieci anni fa su un floppy disk” (GALANTI 2005).

43 For one sample out of many, see <https://www.papyrusonline.com>.

44 Respectively: <http://www.eclipse.org/papyrus>; <http://www.papyruswatch.com>; <https://www.androidcentral.com/papyrus-note-taking-app-goes-10-pdf-import>; <http://www.researchsoftwaredesign.com>; <http://www.isis-papyrus.com>; https://it.wikipedia.org/wiki/Papyrus_Design_Group. The reason for which papyrus has become also the name of a British charity for juvenile suicide prevention (<https://www.papyrus-uk.org>), featuring a schematic papyrus leaf as its logo, remains obscure to me.

45 The interplay between text and context is fundamental in Papyrology: see YOUTIE 1966. This is the conceptual background underlying Youtie’s abovementioned definition of the papyrologist as “artificer of fact”, where the fact is the papyrological data, i.e. the published texts and their reconstructed contexts.

46 BAGNALL 1998, 544.

47 Cf. BAGNALL – GAGOS 2007, 71; DELATTRE – HEILPORN 2014, 314. Technically speaking, catalogues are of course databases themselves. This justifies why I will be referring to metadata catalogues as databases from time to time. On the concept and the mechanics of databases see RAMSAY 2004.

48 VAN MINNEN 2009, 652 points out how desperate is the need for what he calls “‘diplomatic’ handbooks for the various ‘papyrologies’ in existence”, and it seems to me that now the same is needed for the digital resources too, since it is getting more and more difficult to reach a skilful mastery in managing the available electronic information. The *Oxford Handbook of Papyrology* makes constant reference to electronic research tools (cf. BAGNALL 2009a, xx).

49 That the ultimate vocation of Papyrology is publishing the data, i.e. the texts and their contexts, is made clear by TURNER 1973, 7 (“Our first task is to set out precisely what the papyrus says, and to distinguish between what is certain or given by the text and what is a matter of inference. This is the prime responsibility of the papyrologist”) and 14 (“meticulous attention to exact setting out of what the papyrus contains, step-by-step testing of the hypotheses on which even simple restoration is undertaken. This I take to be the meaning of editing, and this is the proper task of a papyrologist”; cf. also ANDORLINI – REGGIANI 2012, 131). We can therefore easily assume that the ultimate purpose of Digital Papyrology is publishing the digital papyrological data, i.e. the digital edition of papyrological texts (see below, § 9).

50 The well-known definition of the 20th century as the “century of papyrology” stems from a

famous prediction by Mitteis and Mommsen (cf. MARTIN 2000 and GONIS 2006) as it has been proved by VAN MINNEN 1993, who afterwards projected it towards the future, speaking of the “millennium of papyrology” (VAN MINNEN 2007). A stronger and stronger reliance on the digital tools shines through the pages dealing with the future of the discipline (VAN MINNEN 2009, but see also Willy Clarysse’s personal experience as recounted in his opening lecture *Papyrology in the 21st Century*, conference “Papyri & Social Networks”, Leiden, October 29, 2015 – abstract online at <http://media.leidenuniv.nl/legacy/abstracts-papyri-%26-social-networks-2015.pdf>), as a validation of the provoking assessment advanced here, which follows a sharp remark made by Fabian Reiter at the beginning of his speech at the International Conference “Medical Papyri in a Digital World”, held at the University of Parma on September 7–8, 2015. It can be noted that the most recent International Congresses of Papyrology are devoting more and more room to entirely digital sessions: while previously a single thematic session at most was devoted to computer matters, it was in 2001 (Wien) that two sessions were reserved to “Instrumenta Studiorum” (mostly digital *instrumenta*) for the first time. Then four panels on “Digital Technology in Papyrology, Epigraphy and Palimpsest Manuscripts” in Helsinki (2004), two on “Technology” in Ann Arbor (2007), two on “Technologie digitale et outils de travail” in Geneva (2010), two on “Papyrological Tools and Projects in Progress” in Warsaw (2013), one on “Experimental Sciences” and two on “New Technologies” in Barcelona (2016). It is the last decade of the 20th century that sees the main turning point of Digital Papyrology, as it can be perceived through the review by OTRANTO 2007, 467–8 (and see below).

51 KRAMER 2004, 24. The ‘electronic phase’ is further divided into several steps: for example, there is an irregular but constant transition from ‘early’ types of digital sources (plainly scanned pictures or texts) to ‘enhanced’ ones (OCRed PDFs, for example) before the bigger step to the Internet hypertext.

52 It is possible to perceive this trend already in the Nineties: cf. OTRANTO 2007, 467–8. It must be stressed that several long-term projects, originally announced on CD-ROM, have then been directly published online: this can make one perceive the rapidity and fluidity of the ever-evolving technological scenario. Not by chance does QUENOUILLE 2016 divide the matter in a pre- and a post-Internet era: “Mit Aufkommen des Internets mußten sich auch die papyrologischen Tools wandeln, was ihnen mit Leichtigkeit gelang. Auch neue Möglichkeiten und neue Hilfsmittel entwickelten sich, so daß heutige PapyrologInnen auf eine Reihe von nützlichen Tools zur Entzifferung und Publikation neuer Dokumente zurückgreifen können. Die entsprechenden Tools sind alle auf Open Access Basis frei und kostenlos zugänglich” (*ibid.*, 11). See also below, §§ 3.6, 6.4, 8.1, 8.3, 8.6. It is impressive, even from browsing a panoramic overview like DELATTRE – HEILPORN 2014, to note that basically all digital resources available today are accessible online in some way. On the relationship between Internet and the Humanities cf. HOCKEY 2004, 13 ff.

53 CHAMPION 1999, 134, quoting O’DONNELL 1998, 41: “the notion that discourse must be fixed to be valid will fade”.

54 “Virtual collaboration between papyrologists at different institutions will result in better work because many archives and dossiers and certainly many types of texts add up to too many items for one papyrologist to handle alone” (VAN MINNEN 2009, 658).

55 See below, *passim*. Short after that congress, KRAFT 1992 noted: “large on the Copenhagen papyrological horizon, along with bibliographies, hyperstacks, graphical representations, and versatility of access, was the consciousness of the value of connecting with the electronic communications networks. I would argue that this is at present the single most important electronic challenge for the inhabitants of academe”.

56 The history, purposes and outcome of this project are recounted by SOSIN 2010 (see below, § 8.3); cf. SCHUBERT 2009, 199.

57 The abovementioned passage about the prime responsibility of the papyrologist (TURNER 1973, 7) is closed by the sharp statement that “[i]t is often not fulfilled with the scrupulousness and unambiguity desired”.

58 Cf. BAGNALL 1998, 551–2. Both integration and standardization are supported by the widespread adoption of XML as the digital standard for representing texts and metadata. XML (*Extensible Markup Language*) is a markup language, i.e. a set of rules for annotating a document with machine-readable instructions (called ‘tags’, i.e. labels attached to strings, words, phrases) describing information about the text (layout, wording, semantics, critical references, etc.). It is not bound to any particular software or platform and is optimized for compatibility, interchange, and durability, so that it can be customized and further developed in subsets (schemas) oriented to specific text categories (cf. RENEAR 2004, 230–1). For instance, the XML-based papyrological resources rely on the EpiDoc guidelines, developed by Tom Elliott and adopted as from 1999 to encode scholarly editions of ancient documents (initially epigraphs) according to the *Text Encoding Initiative* (TEI), an international project launched in 1987 to develop guidelines for the preparation and interchange of electronic texts for scholarly research (<http://www.tei-c.org>; cf. HOCKEY 2004, 12–13; RENEAR 2004, 232–5). TEI provides a general XML schema (or DTD, Document Type Definition) for the digital representation (transcription and description) of texts. It is important to stress that adopting an XML encoding architecture allows databanks to dialogue with each other and to maintain an overall common standard. Moreover, being a structured and semantic markup, it can be processed, queried, translated into another markup or database system, and eventually transformed in a human-readable output by means of a set of stylesheets called XSLT (cf. BODARD 2010; TUPMAN 2010; BABEU 2011, 96–101; BAGNALL 2012a, 4; see also below, § 8.5). Another significant outcome of digital standardization is the development of Unicode, a universal standard for text encoding based on 16-bit numerical codes, as from 1987–1991. Essentially Unicode assigns a unique numerical identifier to alphanumerical characters and other symbols so that they can be universally encoded independently from languages, typefaces and platforms. This has been a great enhancement of digital typewriting, previously based on ASCII 8-bit codes that allowed only a limited set of characters to be managed. In particular, the previous situation made it necessary to encode Greek texts with specific transcoding expedients, which actually encoded the text in ASCII and used specific font sets to display it in Greek characters (Alpha and Beta Code were the earliest: see below, §§ 8.1 and 8.3), so that the users had to run the very same font set used to transcode the text in order to display it correctly. Now Unicode contains a subset entirely devoted to ancient Greek, so that anyone disposing of Unicode-compatible fonts (e.g. *Times New Roman* itself) can display the same characters correctly (cf. MAGNANI 2008, 131–2; see below, § 8.1).

59 Cf. [https://wiki.digitalclassicist.org/Digital_Humanities_in_Papyrology_\(Vannini\)](https://wiki.digitalclassicist.org/Digital_Humanities_in_Papyrology_(Vannini)). I am grateful to Lucia for providing me with some preliminary information about her project. See now also her discussion about “The Role of Digital Humanities in Papyrology: Practices and User Needs in Papyrological Research”, presented at the Digital Classicist London seminar on June 30, 2017 – presentation and livecast at <http://www.digitalclassicist.org/wip/wip2017-05lv.html>. For a general overview of the research habits of the ‘digital humanists’ see BABEU 2011, 177 ff.

60 HOMBERT 1932; text also online on the BP website (<http://www.aere-egke.be/projet.pdf>).

61 NACHTERGAEL – BAGNALL 1979; text online at <http://www.aere-egke.be/historique.pdf>. Cf. also BAGNALL 1998, 544–5.

62 The same need was felt by the Italian scholars who took care of the two bibliographies (“Bibliografia metodica” and “Testi recentemente pubblicati”) on the journal *Aegyptus*, which closely parallel the two prospected sections of BP. The project of digitizing such bibliographies was announced by TIBILETTI 1988 but, as far as I know, never accomplished.

63 Cf. DELL’ORSO 1999.

64 <http://www.aere-egke.be/BP.htm>. For the history of BP digitization see also NACHTERGAEL – MARTIN 2008 and MARTIN 2010, 509–12.

- 65 See below (§ 2.4) for the issues related to the abbreviating system used by the BP.
- 66 Cf. QUENOUILLE 2016, 6.
- 67 Cf. DELATTRE – HEILPORN 2014, 297–8.
- 68 Index codes: <http://www.aere-egke.be/codes.pdf>; papyrological abbreviations: http://www.aereegke.be/sigles_pap.pdf; epigraphical abbreviations: http://www.aere-egke.be/sigles_ep.pdf; abbreviations of periodicals: <http://www.aere-egke.be/periodiques.pdf>.
- 69 But see how BP data are exploited in MARTIN 2009 to trace appraisals and future perspectives of some papyrological studies.
- 70 http://www.trismegistos.org/index_bib.php.
- 71 See below, § 3.3; cf. <http://www.trismegistos.org/edit>.
- 72 NACHTERGAEL 2002, 335.
- 73 OATES – BAGNALL – WILLIS 1974, 1.
- 74 OATES – BAGNALL – WILLIS 1974, 1–2; cf. BABEU 2011, 10.
- 75 CALDERINI 1936, 355; see above, § 1.1.
- 76 OATES – BAGNALL – WILLIS 1974, 2.
- 77 Cf. LECLERCQ 1980.
- 78 OATES – BAGNALL – WILLIS 1978.
- 79 OATES – BAGNALL – WILLIS – WORP 1984, vii.
- 80 OATES – BAGNALL – WILLIS – WORP 1992, viii. For PHI CD-ROMs see below, § 8.3.
- 81 OATES – BAGNALL – WILLIS – WORP 1992, viii.
- 82 OATES – BAGNALL – CLACKSON – O'BRIEN – SOSIN – WILFONG – WORP 2001, ix. A *Checklist of Arabic Documents*, edited by P.M. Sijpesteijn, J.F. Oates, A. Kaplony, E.M. Youssef-Grob, and D. Potthast, is kept separated at <http://www.naher-osten.lmu.de/isapchecklist>, but it followed more or less the same changes as the other Checklist, of which it emulates the structure: a “Beta Version” was published on BASP in 2005 with an introduction about Arabic Papyrology and general observations (SIJPESTEIJN – OATES – KAPLONY 2005), then it moved to the Internet with two versions (2011 and 2016) downloadable in PDF format from the website of the International Society of Arabic Papyrology (ISAP, see below, § 6.1), where a digital version of the original article is also available.
- 83 OATES – BAGNALL – CLACKSON – O'BRIEN – SOSIN – WILFONG – WORP 2001, x; see below, § 8.3.
- 84 Cf. TIBILETTI 1988, 21–2.
- 85 HOMBERT – NACHTERGAEL 1977, 156. The complete plan was published *ibid.*, 157–61. For Calderini see also above, § 1.1.
- 86 HOMBERT-NACHTERGAEL 1977, 162; cf. also NACHTERGAEL 2002, 334.
- 87 TURNER 1980, 159–78; cf. http://www.aere-egke.be/sigles_pap.pdf.
- 88 OATES – BAGNALL – WILLIS 1974, 2.
- 89 <http://hum.leidenuniv.nl/papyrologisch-instituut/project-berichtungsliste/berichtigungsliste-der-griechischen-papyrusurkunden-aus-agypten-bl.html>, see the text of the report presented at the general assembly of the Association Internationale de Papyrologues at Barcelona on August 6, 2016 by F.A.J. Hoogendijk. See also below, § 4.5.
- 90 See e.g. the case recently pinpointed by CASANOVA 2015, 62.
- 91 Still available at http://library.duke.edu/rubenstein/scriptorium/papyrus/texts/clist_appendix.html, but lacking some items.
- 92 Arzt-Grabner's paper will probably appear in the proceedings of the Barcelona Congress, but the author very kindly and wisely has left a digital PDF copy of it at everyone's disposal (https://www.uni-salzburg.at/fileadmin/multimedia/Bibelwissenschaft%20und%20Kirchengeschichte/Griechisch/CongressPap2016_Arzt-Grabner.pdf; Appendix with concordance tables: https://www.uni-salzburg.at/fileadmin/multimedia/Bibelwissenschaft%20und%20Kirchengeschichte/Griechisch/Arzt-Grabner_Concordance_coloured.pdf). To the list of cases recorded by him, we shall probably add “P.Fay.Coles” (or “P.Fayum Coles”), which seems to be an unofficial abbreviation used by some papyrologists to refer to COLES 1970. I myself experienced a great waste of time trying to find out its exact bibliographical

reference. Also GMP for *Greek Medical Papyri* could definitely be added.

93 G.L. Prestige, “a renowned expert in dogmatics” quoted by VAN MINNEN 2007, 714.

94 Cf. BABEU 2011, 9–10; DELATTRE – HEILPORN 2014, 310–1. See also BABEU 2011, 9–12 for further general bibliographical resources.

95 Duke: <http://library.duke.edu/rubenstein/scriptorium/papyrus/texts/bibliography.html>; <http://library.duke.edu/rubenstein/scriptorium/papyrus/texts/greek/literary-bibliography.html> (for the *Duke Papyrus Archive* see below, § 3.6). Michigan: http://www.lib.umich.edu/files/collections/papyrus/tools/Papy_Bibliography.doc.

96 http://classics.uc.edu/~vanminnen/Alexandria/Papyrology_Bibliography.html; http://classics.uc.edu/~vanminnen/Alexandria/Alexandria_Bibliography.html; http://classics.uc.edu/~vanminnen/Alexandria/Early_Roman_Alexandria_Bibliography.html.

97 <http://www.chartes.it/index.php?r=bibliografy/search>; <http://www.chartes.it/index.php?r=bibliografyGeneral> [sic!]; for *Chartes* see below, § 3.6.

98 <http://www.ulb.ac.be/philu/cpeg/preauxbiblio.html>. The booklet (LENGER 1980) was published soon after Préaux’s death. Similarly, a memorial bibliography of P.W. Pestman is published in PDF format at <http://media.leidenuniv.nl/legacy/bibliography-pwp.pdf>.

99 Cf. DELATTRE – HEILPORN 2014, 311.

100 Cf. MARGANNE 2007d, 430.

101 <http://web.philo.ulg.ac.be/cedopal/bibliographies-by-author>; <http://web.philo.ulg.ac.be/cedopal/bibliographies-by-sous-genre/>.

102 <http://web.philo.ulg.ac.be/cedopal/medicine-and-surgery>; MARGANNE – MERTENS 1986 = 1988; 1996 = 1997 (see below, § 3.2).

103 <http://web.philo.ulg.ac.be/cedopal/alexandria-docta-anglais>; <http://web.philo.ulg.ac.be/cedopal/liber-antiquus-anglais/>; cf. MARGANNE 2007b, 76–8. The latter serves also as general reference for the M-P3 catalogue (cf. MARGANNE 2012, 483).

104 CANFORA 2004, 33–82; BOUQUIAUX-SIMON 2004, 51–108.

105 <http://web.philo.ulg.ac.be/cedopal/medecine-dans-legypte-greco-romaine>.

106 <http://web.philo.ulg.ac.be/cedopal/pharmacopoea-aegyptia-et-graeco-aegyptia> (cf. MARGANNE 2007b, 77: a reference database of ancient medical substances has been announced as connected to this bibliography); <http://web.philo.ulg.ac.be/cedopal/papyrus-litteraires-medicaux-bibliographie>; <http://web.philo.ulg.ac.be/cedopal/papyrus-iatromagiques-presentation-et-bibliographie> (this is printed in DE HARO SANCHEZ 2014, 40–4; cf. MARGANNE 2007b, 76); <http://web.philo.ulg.ac.be/cedopal/petitions-et-rapports-medicaux-bibliographie>; <http://web.philo.ulg.ac.be/cedopal/lettres-privees-a-caractere-medical-bibliographie>.

- 107** <http://web.philo.ulg.ac.be/cedopal/corpus-papyrorum-latinarum>; cf. MARGANNE 2013.
- 108** <http://web.philo.ulg.ac.be/cedopal/papyri-latinae-bibliographie-generale>; <http://web.philo.ulg.ac.be/cedopal/les-papyrus-latins-dherculanum>; <http://web.philo.ulg.ac.be/cedopal/papyrus-latins-juifs-et-chretiens-bibliographie-generale>; <http://web.philo.ulg.ac.be/cedopal/bilinguisme-grec-latin-et-le-trilinguisme-grec-latin-copte-en-egypte-bibliographie>
- 109** <http://web.philo.ulg.ac.be/cedopal/judaica-et-christiana>.
- 110** <http://web.philo.ulg.ac.be/cedopal/auteurs-juifs-et-chretiens-ier-iiie-siecles-bibliographie>; <http://web.philo.ulg.ac.be/cedopal/didymus-caecus-bibliographie>; <http://web.philo.ulg.ac.be/cedopal/lettres-chretiennes-grecques-a-caractere-litteraire-bibliographie>; <http://web.philo.ulg.ac.be/cedopal/papyrus-scolaires-grecs-et-latins-chretiens-bibliographie>.
- 111** On *Aristarchus* see BABEU 2011, 160. The platform has been recently refurbished.
- 112** <http://www.aristarchus.unige.net/CIAPh/it-IT/Home>. APh: <http://www.annee-philologique.com>.
- 113** BAGNALL – GAGOS 2007, 74.
- 114** For example, many papyrus editions are titled *Catalogue* though containing also transcriptions of the texts: BKT IX (*Catalogue of Greek and Latin Literary Papyri in Berlin*); P.Aberd. (*Catalogue of Greek and Latin Papyri and Ostraca in the Possession of the University of Aberdeen*); P.Ashm. (*Catalogue of the Demotic Papyri in the Ashmolean Museum*); P.Brit.Mus. (*Catalogue of the Demotic Papyri in the British Museum*); P.Brookl.Dem. (*Catalog of Demotic Texts in the Brooklyn Museum*); the various P.Cair. pointing to the *Catalogue Général des Antiquités égyptiennes du Musée du Caire*; P.Lond.Copt. (*Catalogue of the Coptic Manuscripts in the British Museum*); P.Lond.Lit. (*Catalogue of the Literary Papyri in the British Museum*); P.Mert. (*A Descriptive Catalogue of the Greek Papyri in the Collection of Wilfred Merton*); P.Michael. (*Papyri Michaelidae, being a Catalogue of Greek and Latin Papyri, Tablets and Ostraca in the Library of Mr G.A. Michailidis of Cairo*); P.Petersb. (*Catalogue des manuscrits grecs de la Bibliothèque Impériale Publique*); P.Ryl. (*Catalogue of the Greek and Latin Papyri in the John Rylands Library, Manchester* – and so P.Ryl.Dem. and P.Ryl.Copt. for the Demotic and the Coptic papyri of the same collection). For this reason the *Checklist* is forced to specify, e.g., that P.MorganLib., *Catalogue of Coptic Manuscripts in the Pierpont Morgan Library* (ed. L. Depuydt, Leuven 1993), “is not an edition but a catalogue, listing in volume 1 the 421 Coptic items in the Morgan Library”. The same annotation, e.g., for P.Schreibertrad. (*Die Ägyptische Schreibertradition in Aufbau, Sprache und Schrift der demotischen Kaufverträge aus ptolemäischer Zeit*, ed. K.-Th. Zauzich, Wiesbaden 1968), makes it clear that ‘catalogue’ is generally understood to be a list of descriptive metadata rather than to proper editions dealing with texts, i.e. data: “A catalogue of sales (nos. 1–95) and associated cession documents (nos. 96–159), not an edition of texts. In some cases, however, a transcript and translation of a text are given”. After all, catalogues of libraries usually do not contain the full text of the books preserved there, but only the relevant descriptive details, i.e. the metadata. Therefore, we do find that the *Catalogue des papyrus iatromagiques grecs* (DE HARO SANCHEZ 2004) rightly records only the metadata of this peculiar thematic group of texts; the same happens with the *Catalogo dei papiri ercolanesi* edited by M. Gigante. An analogous meaning can be borne by the word ‘inventory’ (see e.g. M.-H. Marganne, *Inventaire analytique des papyrus grecs de médecine*, Genève 1981), though it usually recalls the archival identifying of a specific collection.
- 115** COWEY 1994. The following quotations are all from this article, p. 609.
- 116** Seider presented this project in an unpublished talk delivered at the 13th International Congress of Papyrology (Marburg 1971). The idea itself, in fact, goes back to Montevicchi’s methodological outlines (see Introduction, § 1.1), where she explicitly speaks of the need for “una lista generale di documenti di ogni genere, ordinati cronologicamente” and for “una serie ben nutrita di fac-simili di papiri sicuramente datati ordinati cronologicamente” (MONTEVECCHI 1966, 47). Seider’s well-known palaeographical volumes (SEIDER 1967–

90; 1972–81) are of course a spin-off of this extensive project.

117 Cf. HAGEDORN 1994, 229.

118 See above, § 2.1; cf. QUENOUILLE 2016, 10.

119 Noteworthy is the explicit statement by HAGEDORN 1994, 230, that no paper version of HGV has ever been envisaged.

120 “Ihre ursprüngliche Zielsetzung war, einen schnellen Überblick darüber zu ermöglichen, welche Papyri usw. aus einem bestimmten Zeitraum als Quellen zur Verfügung stehen” (from the *Einführung* at <http://aquila.zaw.uni-heidelberg.de/introduction>). Cf. HAGEDORN 1994, 227.

121 Cf. COWEY 1994, 610–1.

122 Detailed descriptions of these fields can be found in COWEY 1994, 609–11, and HAGEDORN 1994, 227–8; cf. also BABEU 2011, 145.

123 This was already noted by R.S. Bagnall in an early review of the HGV, published in 1998 on the *Bryn Mawr Electronic Resources Review* (<http://csanet.org/bmerr/1998/BagnaHeideAug.html>). For recent attempts to automatically categorize papyri on the basis of standard topics see below, § 7.1.

124 Because of the strong chronological focus of the HGV, the search options for dates and periods are particularly complex and effective. It is perhaps worth citing the relevant section from the help page (<http://aquila.zaw.uni-heidelberg.de/help/search/en>): “Here are a few concrete examples of searches that might be carried out (preliminary remarks: Arabic numerals only are to be used in the fields ‘Band’, ‘Nummer’, ‘J’, ‘M’, ‘T’, ‘J2’, ‘Jh’ and ‘Jh2’):

1) A search for all entries dating from the years AD 275–285. One enters ‘275...285’ in the field ‘J’ (= Jahr).

2) A search for all entries dating from the years 80–50 BC, which come from Arsinoites. One enters ‘-80...-50’ in the field ‘J’ and ‘Arsinoites’ in the field ‘Ort’ (or ‘Arsin’ or ‘Arsi’).

3) A search for all entries of papyri dating from the years AD 450 and 490, which come from Herakleopolites and of which there are published photographs. One enters ‘450...490’ in the field ‘J’, ‘Herakl.’ in the field ‘Ort’ and ‘keine’ in the field ‘Abbildung’. In the case of the last entry the option ‘Enthält nicht’ must be used. Information concerning published photographs of any given document are only available in ‘Formular’ layout.

4) Anyone searching for all documents which may have been written in AD 602 must enter ‘602’ in ‘J’ and then in ‘J2’ as well as clicking on the option ‘ODER’. The field ‘J2’ (= ‘Jahr 2’) makes sure that papyri dated to AD 601–602 are found.

5) Anyone searching for all documents which may have been written in the second century BC must carry out two separate searches: a) one enters ‘-199...-100’ in field ‘J’ and then (with the option ‘ODER’) ‘-2’ in field ‘Jh’ (= ‘Jahrhundert’). b) ‘-2’ in field ‘Jh2’ (in order to find documents dated ‘III–II v.Chr.’).

6) The use of the formula fields ‘ChronMinimum’ and ‘ChronMaximum’, which were added at a later date (November 2003), ought to be explained at greater length, as they open up further possibilities whenever a detailed chronological search is desirable.

The fields are self explanatory if the date in question is e.g. 98–117 or 231–232: in these cases the starting and end dates of any given period appear in the fields ChronMinimum and ChronMaximum. Dates which were assigned to centuries are converted with the use of a formula. For ‘III’ for example, the value accorded to the fields are: ChronMinimum = 201 and ChronMaximum = 300; for ‘Mitte IV’ ChronMinimum = 326 and ChronMaximum = 375; for ‘Ende III – Anfang II v.Chr.’ ChronMinimum = -225 and ChronMaximum = -176; etc. Up to now if one wanted to find texts belonging to the reign of Trajan, it was possible to enter 98...117 into the field J(ahr). This, however, resulted in a list of texts which were dated to precisely this span of 20 years or to a period of which the starting year fell in this span (e.g. 110–120). Dates such as ‘95–100’ were not found. With the help of the new fields it is now possible to find all records, which might potentially belong to any given time period. Thus if one wants to find all documents, which may potentially come from the reign of Trajan,

'50...117' should be entered in ChronMinimum and '98...150' should be entered in ChronMaximum in the same search. In this way texts are found which are dated 'ca. 70–130' as in P.Hib. II 215, '81–138' as in O.Elkab 28 or 'Ende I – Anfang II' as in P.Oxy. LXVI 4533. As can be seen, it is necessary to create an overlap with the time period in question (i.e. 98–117) when making an entry in the search fields. The outermost date limits of the search, '50' and '150', represent the tolerance and can of course be altered as one pleases. In the example above all texts will be found with a date of '1. Hälfte II' (because of ChronMaximum ...150), those dated to 'Mitte II' or simply 'II' will not, however, be found. If one wanted to find these as well, one would have to increase the tolerance and search for '98...175' or '98...200'. Likewise the tolerance could be increased in ChronMinimum to '1...117', to include texts dated to 'I–II'. Searches with the criteria ChronMinimum $\leq$ 200 and ChronMaximum $\geq$ 101 or with $\leq$ 115 for ChronMinimum and $\geq$ 115 for ChronMaximum represent an extreme expansion of the tolerance. They produce all records, which are possibly (or definitely) dated to the second century AD or all time periods in which the year 115 is included, that is even to texts dated 'I–VIII' or completely undated texts".

125 Cf. COWEY 1994, 609.

126 Both wishes were expressed by Roger Bagnall in his early review mentioned above: "[a]s papyrological tools continue to develop, we will look for direct links between the HGV and the Duke Data Bank of Documentary Papyri, which contains the Greek texts of the papyri listed in the HGV, as well as digitized images and other resources" (see also below). A two-year project was launched to prepare German and English translations for a selection of texts from the first four BGU volumes as an enhancement to HGV; its results were presented by James Cowey at the 25th International Congress of Papyrology (Ann Arbor, 2007; paper not included in the *Proceedings*); cf. <http://www.papy.uni-hd.de/Erweiterung.htm>; also QUENOUILLE 2016, 13. Other translations are taken from *Papyri.info*.

127 <http://aquila.zaw.uni-heidelberg.de/publicationList>.

128 Cf. COWEY 1994, 609.

129 Cf. already CALDERINI 1936, 355.

130 PACK 1965² [19521]; cf. RENNER 2009, 292; SCHUBERT 2009, 199.

131 Cf. OTRANTO 2007, 449.

132 Cf. PACK 1965, vii.

133 MERTENS 1964.

134 Cf. <http://web.philo.ulg.ac.be/lasla> (see below, §§ 3.5, 7.1, and 8.2).

135 MERTENS 1968a; 1968b; 1970; 1975; cf. STRAUS 1983.

136 The picture, as well as the historical and technical information about the constitution of M-P³, are taken from MARGANNE 2007b, 64–75 = 2007d.

137 MERTENS 1981; 1985; 1987; MARGANNE – MERTENS 1988 (19972); LENAERTS – MERTENS 1989; MARCOTTE – MERTENS 1990; 1994; BOUQUIAUX-SIMON – MERTENS 1991; 1992; MERTENS 1992; MERTENS – STRAUS 1992; MERTENS 1996; MARGANNE 2000.

138 Cf. RENARD 2000; for details about the electronic records see also MARGANNE 2007d, 430–2 = 2007b, 69–72.

139 Cf. OTRANTO 2007, 449–50; MARGANNE 2007b, 75 ff.; 2012, 483–4.

140 Cf. MARGANNE 2012. Pack referred to already existing special catalogues as to magical papyri (Preisendanz, PGM I–II), horoscopes (NEUGEBAUER – VAN HOESSEN 1957), biblical, Jew and Christian papyri (Aland and VAN HAELST 1976). On the extension to the *Corpus Papyrorum Latinarum* see also MARGANNE 2013.

141 Cf. MARGANNE 2016.

142 Cf. MARGANNE 2012, 484.

143 MARGANNE 2007b, 75–6; nice case of a paper resource stemming from a digital one, and not vice versa, in the wake of the CEDOPAL's tradition (see above, § 2.5).

144 <http://web.philo.ulg.ac.be/cedopal/papyrus-latins-juifs-et-chretiens>; <http://web.philo.ulg.ac.be/cedopal/auteurs-juifs-et-chretiens-ier-iiie-siecles>; [http://](http://web.philo.ulg.ac.be/cedopal/auteurs-juifs-et-chretiens-ier-iiie-siecles)

web.philo.ulg.ac.be/cedopal/didymus-caecus-2;<http://web.philo.ulg.ac.be/cedopal/lettres-chretiennes-grecques-a-caractere-litteraire>;<http://web.philo.ulg.ac.be/cedopal/papyrus-scolaires-grecs-et-latins-chretiens>;<http://web.philo.ulg.ac.be/cedopal/papyrus-latins-dherculanum>;<http://web.philo.ulg.ac.be/cedopal/petitions-et-rapports-medicaux>;<http://web.philo.ulg.ac.be/cedopal/lettres-privees-a-caractere-medical>.

145 DE HARO SANCHEZ 2014. Cf. MARGANNE 2007b, 76; 2012, 482.

146 MARGANNE 2007b, 79.

147 Cf. BABEU 2011, 10–11.

148 Cf. GONIS 2001, 422, who greets LDAB while waiting for the 3rd edition of Pack's catalogue.

149 VAN HAELST 1976.

150 CLARYSSE 2001, 237; cf. RENNER 2009, 291.

151 Cf. CLARYSSE 2001, 237, and the introduction to the online database at <http://www.trismegistos.org/ldab/about.php>.

152 For a description of these fields see CLARYSSE 2001, 238–42.

153 Presented at the 22nd International Congress of Papyrology, Florence 1998 (CLARYSSE 2001).

154 Cf. CLARYSSE 2001, 243–9.

155 Cf. HUYS 1999.

156 “The graphs it allows one to create are very useful [...], for pedagogical purposes, to show which authors were most read in Antiquity, or the development of the use of the *codex* form and of the parchment, at the expense of, respectively, the *volumen* and the papyrus” (DELATTRE – HEILPORN 2014, 319–20).

157 Cf. GONIS 2001, 421.

158 LDAB numbers were originally assigned by a sorting programme, first by author name, then by date, then by inventory number. From number 7097 onwards the entries were simply added to the list one after another. TM numbers (see below, § 3.3) show the same feature.

159 MORGAN 2003a. The author did the same with a general overview of literary culture in late antique Egypt (MORGAN 2003b).

160 MORGAN 2003a, 201.

161 PAPATHOMAS 2003.

162 DEPAUW – GHELDOLF 2014; cf. BABEU 2011, 144–5; DELATTRE – HEILPORN 2014, 314–5.

163 Cf. DEPAUW – GHELDOLF 2014, 41. For the *Prosopographia Ptolemaica* see below in this same § 3.3.

164 http://www.trismegistos.org/about_history.php (cf. also DEPAUW – GHELDOLF 2014, 42).

165 Cf. DEPAUW – GHELDOLF 2014, 43; DELATTRE – HEILPORN 2014, 314.

166 Cf. GHELDOLF 2016.

167 “Although the TM number is increasingly used as an identifier, its use in a nondigital or human-readable environment is not yet very widespread” (DEPAUW – GHELDOLF 2014, 45).

168 See Arzt-Grabner’s table cited above, 2.4. A lookup tool for the TM abbreviations is kindly provided at http://www.trismegistos.org/tm/publication_lookup.php.

169 Cf. GHELDOLF 2016.

170 <http://dev.ulb.ac.be/philo/bad/copte/baseuk.php?page=accueiluk.php>. BCD started in 2000 and was published online in 2005. It collects all published Coptic documentary texts; metadata comprise edition ID, TM number, inventory number, material, dialect, provenance, date, content (brief title and keywords), bibliography, and miscellaneous remarks. There is also a TM-independent search engine (<http://dev.ulb.ac.be/philo/bad/copte/baseuk.php?page=rechercheruk.php>) that allows querying those fields. See below, § 8.4, and cf. BABEU 2011, 145.

171 <http://www.naher-osten.lmu.de/apd>. APD collects metadata of more than 150,000 Arabic papyri from the 7th up to the 16th century AD, and in some cases provides also the full texts (not implemented in TM). The encounter between Arabic papyrology and the digital resources dates back to 2002/03, when an online *Arabic Papyrology School* was launched as an interactive introductory school for the understanding of Arabic documents (<http://www.naher-osten.lmu.de/aps>; cf. DELATTRE – HEILPORN 2014, 325). The database started in 2004, modelled on the extant Greek papyrological tools (above all, HGV) with some adaptations due to the peculiarities of the discipline. “Both simple and advanced searching options are available, and the APD supports lemmatized searching of the papyri text and a full search of the metadata. The collection of papyri can also be browsed by name, metadata, or references. Each papyrus record includes full publication metadata, the full Arabic text (including variant readings and apparatus), a transcription, and relevant lexicon entries for words” (BABEU 2011, 145). Both resources (online school and database) are supported by the International Society for Arabic Papyrology (<http://www.naher-osten.lmu.de/isap>).

172 On the issues raised by a possible integration of such disparate resources, in terms of languages and cultures considered, time spans covered, etc., see DELATTRE – HEILPORN 2014, 316–8.

173 Cf. <http://www.trismegistos.org/magic/about.php>; DELATTRE – HEILPORN 2014, 320–1.

174 Cf. DELATTRE – HEILPORN 2014, 319.

175 For a detailed description of its fields see DEPAUW – GHELDOLF 2014, 45–9, and the picture below. Very recently, a search function for text reuse has been introduced (http://www.trismegistos.org/tm/search_reuse.php).

176 TM introductory guide makes this clear: <http://www.trismegistos.org/guide.php>.

177 Cf. VANDORPE – WAEBENS 2010 on the Ptolemaic papyrus archives of Pathyris (with a PDF survey and bibliography at <http://www.trismegistos.org/arch/pathyris.php>) and VANDORPE – CLARYSSE – VERRETH 2015 on papyrus archives from Graeco-Roman

Fayum (PDF list at <http://www.trismegistos.org/arch/fayum.php>). A general bibliography on ancient archives is offered at <http://www.trismegistos.org/arch/help.php>, and special section is devoted to the theme of *tomoi synkollesimoi* (cf. CLARYSSE 2003), with PDF resources at <http://www.trismegistos.org/arch/tomos.php>. On the theoretical foundations of the archives database project see VAN BEEK 2007.

178 For details and technical issues see DEPAUW – VAN BEEK 2009; cf. also BABEU 2011, 173.

179 Cf. PEREMANS 1946; VAN’T DACK 1992.

180 Cf. DEPAUW – VAN BEEK 2009, 32–3.

181 Cf. MOOREN 2001.

182 Cf. DEPAUW – VAN BEEK 2009, 34–40; BROUX – DEPAUW 2015b, 305–6; see also BABEU 2011, 172–3. NER is combined with Social Network Analysis (SNA: see below, § 7.2) to pinpoint prosopographical relations and further define the results. For other projects involving SNA for prosopographies see BABEU 2011, 167. Earlier attempts to automatically extract prosopographical information from papyrological texts were made by Alfred Tomsin in the Sixties: see below, § 3.5

183 PREISIGKE 1922; FORABOSCHI 1967–1971.

184 Cf. <https://www.academia.edu/10835341/Ghostbuster-helpfile>.

185 Cf. KRAFT 1992 and the documentation appended as Appendix 1, below.

186 Cf. CLARYSSE 2005, 19–20 (and ff. for a case study based on the collected data); BROUX 2016a, 296–7.

187 Several issues were addressed by Herbert Verreth in a communication delivered at the 26th International Congress of Papyrology (Geneva 2010), titled *Topography of Egypt Online*, of which just an abstract was published in the *Proceedings* (VERRETH 2012).

188 MUELLER 2005b (see below, § 7.2).

189 Cf. CLARYSSE – VERRETH 2000; VAN BEEK 2007, 1041–2 (“why collections do matter”).

190 Cf. VAN MINNEN 2007, 708–11.

191 History of the tool and research samples in DEPAUW – BROUX 2016, where the provision of information by the papyrological community is referred to as “an overwhelming illustration of the *amicitia papyrologorum*” (p. 202). Of *digital amicitia papyrologorum*, we may gloss.

192 DELATTRE – HEILPORN 2014, 327–8, note about *TM People*: “As this database assigns a unique number to each individual attested, we hope the time will come (once everything has been cleaned up and checked, we suppose) where people will start to refer, when they edit a new document about someone already known, to even Zenon son of Agreophon not only as ‘PP 80 + add. = 666 = 1044 + add. = 7982 = 9749’, but ‘TM PER 1757’”.

193 A relational database is a dataset organized according to a relational model of data, i.e. tables arranged in rows and columns containing lists of entities and their respective value. Rows bear unique numerical identifiers and can be linked to rows in other tables by adding a column for the unique key of the linked row. Tables are also given unique keys, and relationships can be constructed among them. Relational databases use Structured Query Language (SQL) for querying and managing data (*Trismegistos* uses Oracle MySQL). Such an architecture is particularly adequate to manage the complex interrelations among resources and data, in a very wide network that well represents the complicated universe of papyrological metadata. Cf. RAMSAY 2004, 178 ff.

194 BROUX – DEPAUW 2015b, 307; cf. JENNES – DEPAUW 2012; DEPAUW – CLARYSSE 2013; BROUX 2015a; COUSSEMENT 2016.

195 DEPAUW – ARLT – ELEBAUT *et al.* 2008: *A Chronological Survey of Precisely Dated Demotic and Abnormal Hieratic Sources*; VERRETH 2013: *A Survey of Toponyms in Egypt in the Graeco-Roman Period*; VERRETH 2009: *The Provenance of Egyptian Documents from the 8th Century BC till the 8th Century AD*; BENAÏSSA 2012: *Rural Settlements of the Oxyrhynchite Nome. A Papyrological Survey*; VERRETH 2011: *Toponyms in Demotic and*

Abnormal Hieratic Texts from the 8th Century BC till the 5th Century AD; WÖRZ 2012: *A New Survey of Greek, Coptic, Demotic and Latin Tabulae Preserved from Classical Antiquity*; BROUX 2015b: *Double Names in Roman Egypt: A Prosopography*; VERRETH 2006: *The Northern Sinai from the 7th Century BC till the 7th Century AD. A Guide to the Sources*.

196 DEPAUW fth. (announced in VERRETH 2009, 7).

197 Cf. DEPAUW – GHELDOLF 2014, 50.

198 See e.g. *TM Latin Abbreviations* (<http://www.trismegistos.org/abb>), an appended database of Latin epigraphic abbreviations based on the Clauss-Slaby epigraphic database (EDCS: <http://www.manfredclauss.de>).

199 As wished by BOWMAN – DEEGAN 1997, 152 (“Distances between disciplines, institutions, and continents can be bridged by grasping the prospects held out to us by the new technologies”) and BAGNALL 2012a, 14 (“the future of papyrological projects lies in transcending the limited scale of the discipline and its separateness”). See also DELATTRE – HEILPORN 2014, 330–1. On interdisciplinarity as a main feature of Digital Classics cf. TERRAS 2010, part. 175–80. For further, prospective developments of TM see DEPAUW – GHELDOLF 2014, 50–1: models for Open Data environments, ontologies, links to other external resources like *Pleiades* (<https://pleiades.stoa.org>) for ancient places (on *Pleiades* see TUPMAN 2010, 85–6, and BABEU 2011, 90–2).

200 http://www.trismegistos.org/about_identifiers.php. The disclaimer goes on with interesting practical examples and has been proposed again in DEPAUW – GHELDOLF 2014, 43–5.

201 Cf. MONTEVECCHI 1998, 9.

202 ANDORLINI – REGGIANI 2012, 138–9.

203 For a general and external point of view, one may refer to CALLAGHAN 2014 on collection, management, and exploitation of datasets in scientific research.

204 MENCI 1994; LANCELLOTTI 2000, 161–3; DE LUCA 2007; CLARYSSE – PAGANINI 2009. I am grateful to Giovanna Menci for telling me the fate of her past project. It is very meaningful of the technological gap between now and then.

205 Cf. e.g. DEPAUW – VAN BEEK 2009, *passim*.

206 Project conducted by Andrea Jördens and Uri Yiftach (<http://www.uni-heidelberg.de/md/zaw/papy/forschung/abstract.pdf>), see e.g. REGGIANI 2016.

- 207** Open access at <http://synallagma.tau.ac.il/?project=glrt&username=guest&password=guest>. The project was initially developed in collaboration with Laura Boffo and Michele Faraguna, University of Trieste.
- 208** Cf. <http://www.artlid.com>.
- 209** See the full presentation of the database by U. Yiftach himself at https://www.academia.edu/1695380/Presentation_of_Greek_Law_in_Roman_Times_Vienna. Some samples of data extraction and elaboration are given by the same author at <https://telaviv.academia.edu/UriYiftach/projects>. Cf. also, e.g., YIFTACH 2015. The GLRT database was presented at the 25th International Papyrological Congress (Ann Arbor 2007), unpublished paper by U. Yiftach as well.
- 210** Cf. HUYS – SCHMIDT 2007.
- 211** Cf. DELATTRE – HEILPORN 2014, 324: “the question arises of the survival and later evolution of such projects, where one individual is primordial”.
- 212** Cf. RENNER 2009, 283.
- 213** For further details, cf. HUYS – NODAR 2007.
- 214** Cf. VAN MINNEN 1994, 40 n. 20.
- 215** Cf. DUÉ 2010 and see below, § 9.
- 216** Cf. <http://chs.harvard.edu/CHS/article/display/1563>.
- 217** On the differences between the two lists see MONTANARI 2012, 3–4.
- 218** <http://areopage.net/PDF/PapyriFromTheRiseOfChristianityInEgypt.pdf>.
- 219** = VANDORPE 1997, with additions; cf. also VANDORPE – VAN BEEK 2012.
- 220** Bibliography on the project at <http://www.dime-online.de/literatur.php>.
- 221** LIPPERT – SCHENTULEIT 2005.
- 222** For further details, cf. SCHENTULEIT 2006 and SCHENTULEIT – LIEDTKE 2008; see also BABEU 2011, 173.
- 223** WOPR 2017 (recently updated from 2013 Version 1.0).
- 224** Cf. WINKLER 2008; DELATTRE – HEILPORN 2014, 316.
- 225** Former URL: <http://www.ucl.ac.uk/GrandLat/research/christianpapyri.htm> (cf. CAPASSO 2005, 232; OTRANTO 2007, 457). The page is fortunately preserved by the Internet Archive (latest capture, June 2008: <http://web.archive.org/web/20080601042728/http://www.ucl.ac.uk/GrandLat/research/christianpapyri.htm>). Other online resources related to Christian papyri are the *Complete List of Greek NT Papyri* by W. Willker (<http://www.willker.de/wie/texte/Papyri-list.html>) a plain table containing references to edition, date, location of New Testament papyri, and the indication of the passages preserved (a link points also to available online images), and the much similar *Catalogue of New Testament Papyri & Codices* (from the II to the X century), edited by K.C. Hanson (<http://www.kchanson.com/papyri.html>). Not limited to the papyri is the *New Testament Virtual Manuscript Room* (NTVMR) of the Münster University (<http://ntvmr.uni-muenster.de>), a workspace allowing to browse and search for New Testament manuscripts (including papyri), of which pictures and transcriptions are displayed in parallel windows, when available. For another case of disappeared resource see the website of the Department of Papyrology of the Warsaw University (below, §§ 6.1 and 6.4).
- 226** Cf. SMITH 2004.
- 227** Cf. SCHOLL 2008, 32–3. Many examples might be produced to illustrate the benefits of cataloguing a papyrus collection. To limit us to few remarkable cases of digital cataloguing, during the indexing of the Würzburg collection for the *Papyrus Projekt* (see below, § 3.6) some new archives have been discovered and known archives were extended by new texts (namely, the archives of Eutychides Sarapion’s son and of Arsinoe’s soldiers: see at <https://papyri-collection.dl.uni-leipzig.de/content/archiv.xml>). Also, and more deeply to the core of papyrological research, cataloguing very often leads to improvements in the understanding of the documents themselves: cf. GAGOS 2001, 527. This is a valuable outcome also of the more general catalogues: suffice it to recall the improvements in the dating of many fragments reconsidered while recorded in HGV (see above, § 3.1), and the results obtained during the

cataloguing work for M-P3 (cf. MARGANNE 2007d, 432–3 = 2007b, 72–5).

228 Cf. TAIT 2002.

229 Cf. e.g. GAGOS 1997 and BAGNALL 1998, 547 ff., on the very early connection between digital cataloguing and digital imaging. See also VAN MINNEN 2009, 649.

230 Not all collections have an online catalogue. For a ‘traditional’ survey of papyrus collections see CLARYSSE – VERRETH 2000, also for the history of the collections themselves. Of course, see also the database *TM Collections* (see above, § 3.3). Some new digital catalogues are expected in the near future, such as that of the Greco-Roman Museum of Alexandria announced by EMPEREUR 2000, 617–8.

231 Cf. GAGOS 1997, 155; in fact, experimentations had been conducted at the University of Michigan since 1990/91 (see also GAGOS 2001, 516).

232 VAN MINNEN 1995. Noteworthy is the stress posed on standards.

233 VAN MINNEN 1995.

234 Bagnall, then President of the American Society of Papyrologists, outlined the project at the International Congress of Copenhagen in 1992: cf. BAGNALL – GAGOS 2007, 59 and 63–5.

235 On the rise of digital cataloguing in Michigan see GAGOS 1997 and 2001, 525–7.

236 <http://papyri.info/docs/apis>.

237 Historical and technical information is still available at <http://www.columbia.edu/cu/libraries/inside/projects/apis>, though the latest update is to 2005. For the inclusion of St. Petersburg cf. BAGNALL – GAGOS 2007, 66–7. On the digital cataloguing of the Lund papyri and their integration into APIS cf. KULNEFF-ERIKSSON 2005.

238 See above and below, §§ 1.2 and 8.4. As was written in the first application (1995) to the NEH for funding the APIS project: “What is distinctive about this project is exactly the reason that it is not a batch of unrelated applications for these preservation purposes: the institutions involved will adopt collectively a set of standards for imaging, for the formats of the electronic data generated, and for the linking of the various sets of electronic data. The entire project will thus be carried out with a view to the creation of an integrated information system, available over the Internet. The cooperative aspect of the proposal is thus central to its existence, for it will replace the prospect of a world of incompatible, separate systems, each with its own standards, with that of a single, seamless system that will be readily usable not only by papyrologists but by scholars and students in other fields. By beginning APIS now, we will be able to lead to the adoption of these standards not only in North America but worldwide and set an example to other disciplines of what is possible” (<http://www.columbia.edu/cu/libraries/inside/projects/apis/admin/grants/neh.app.95.html>). Cf. also BAGNALL – GAGOS 2007, 67–8; BABEU 2011, 142.

239 “Guidelines for APIS Metadata Contributors” were provided at <http://www.columbia.edu/cu/libraries/inside/projects/apis/guidelines.html>.

240 “The collections module, with a metadata record editor, of papyri.info is now open to all institutions, whether or not they are APIS members. Collections of any size may contribute catalog records, images, texts, translations, and metadata to papyri.info directly, once they establish an authorized editorial structure” (<http://papyri.info/docs/apis>). See below, § 8.4.

241 Cf. <http://www.psi-online.it/about>. On goals and technical details of the project see, in general, DEL CORSO 2007. A partial catalogue of the “Istituto Vitelli” collection was included in a CD-ROM (ANDORLINI – BASTIANINI – MANFREDI – MENCI 2003; cf. CAPASSO 2005, 232), which is, in turn, the digital re-edition of a printed booklet (AA.VV. 1992; see below, § 6.1). A recent communication by Lucio Del Corso (July 1, 2017) announced an update: images and descriptions of P.Flor. I–III have been made available as well.

242 Cf. <http://dvctvs.upf.edu/project>; BABEU 2011, 144.

243 DEL CORSO 2007, 172.

244 Cf. BAGNALL 1998, 546–7. On SGML cf. HOCKEY 2004, 12 ff.; MCGANN 2004, 202; RENEAR 2004, 221 ff.; see below, § 8.3.

245 http://www.organapapyrologica.net/content/papportal_start.xed. As we read from the detailed presentation of the project, “differences between the local databases have been standardised [...] or equalized with concordances. In this way a standard for future cataloguing in papyrus collection was created” (http://www.organapapyrologica.net/content/papportal_general.xml). The project was announced by R. Scholl and M. Gerhardt at the International Congress of Ann Arbor in 2007 (paper not published, abstract at pp. 41–2 of the *Proceedings*). For a full description of the project and its technical details see FREITAG – GERHARDT – KUPFERSCHMIDT – SCHOLL 2009, 2016a, and 2016b; BABEU 2011, 143; QUENOUILLE 2016, 16–18.

246 <http://www.mycore.de>; cf. SCHOLL 2008, 31; KUPFERSCHMIDT 2016.

247 The *Papyrus Projekt Halle-Jena-Leipzig* was first announced at the 23rd International Congress of Papyrology, Vienna 2001 (HAMMERSTAEDT – SCHOLL 2007; SCHOLL 2008; BABEU 2011, 143–4); on its outcome see now BLASCHEK – QUENOUILLE 2016.

248 On the German *Papyrus Projekt* see description and technical details in SCHOLL – KUPFERSCHMIDT – WERMKE – KÖRNER – ZIMMERMANN 2017.

249 This was already the main concern of BAGNALL – GAGOS 2007, 72 for the future of APIS and related resources, as well as the bottom line of the conclusions reached at a meeting about digital information in Papyrology, held in June 2004 at the Papyrological Institute of the University of Leiden (cf. BAGNALL – GAGOS 2007, 72–4: “Generally, the Leiden meeting found itself working toward a sense that an integrative tool was likely to be a flexible information gatherer capable of working with different data structures and presenting its results to the user in a perhaps deceptively coherent format, rather than a single, rigid database structure into which everything would have to fit”, p. 74).

250 Cf. e.g. <http://aquila.zaw.uni-heidelberg.de/hgv/3207>, one of the first sample “Easter Eggs” of that kind, to quote the term employed by James Cowey in the message announcing this effective implementation to the papyrological mailing list (March 30, 2017).

251 GAGOS 2001, 516.

252 BAGNALL 2012b (see below, § 9).

253 It seems relevant to report the “‘Ten commandments’ for constructing websites of papyrus collections” as outlined by VAN MINNEN 2007, 713: “1. Include the (unique) inventory number in the electronic addresses of records about, and images of, papyri; 2. Include the dpi scale in the electronic address of images; 3. Use 72 dpi images to record what a papyrus looks like on a 72 lpi screen; use 150 dpi images to provide over 95% legibility; use 600 dpi images as archival copies and for over 99% legibility; 4. Do not use a fancy background against which text is displayed; 5. Provide both searching and browsing options; 6. Make sure every page is self-contained and provides the user with an idea of where he is; 7. Websites should be digestible as a self-contained entity and as part of a larger whole; 8. Provide as many acquisition data as possible; 9. Provide information about fair use and publication policy on each record; 10. Provide a lasting contact address”.

254 GAGOS 2001, 516.

255 BAGNALL 1998, 552.

256 DEL CORSO 2007, 168.

257 From the cited website.

258 <http://www.papyrologie.paris-sorbonne.fr/menu1/collections/pgrec/peuphrate.htm>.

259 “Les papyrus sont dispersés à leur découverte qui s’est faite pour leur très grande part clandestinement. [...] Si les papyrus découverts dans les fouilles officielles et ceux que Lefebvre a réussi à racheter aux habitants sont actuellement au Musée du Caire (près de 400 textes édités), les autres ont été dispersés dans quelque 25 collections de plus de 10 pays. La plupart de ces collections n’ont pas encore mis leur fonds en ligne” (all quotations from the cited page). Cf. DELATRE – HEILPORN 2014, 326.

260 Cf. <http://www.trismegistos.org/archive/103>.

261 A shareware *HyperCard* application for *Macintosh* was developed some time ago by Willy and Jeroen Clarysse as an introduction to the archive of Zenon; it was called *Zenon Presentation* and was based on a Dutch booklet by W. Clarysse and K. Vandorpe. It was presented at the 20th International Congress of Papyrology at Copenhagen, in 1992: cf. KRAFT 1992 and see Appendix 1, below.

262 https://oi-archive.uchicago.edu/OI/DEPT/RA/ABZU/DEMOTIC_WWW.HTML.

263 Cf. VAN MINNEN 1994, 40.

264 Think only of the cuneiform lexical lists, which can be considered as the earliest databases of human knowledge (information): cf. CIVIL 2002; VELDHUIS 2014.

265 Cf. e.g. EVANS – OBBINK 2010, 1–3.

266 Respectively: DARIS 1968; PREISIGKE 1925–31 with subsequent supplements; PREISIGKE 1915; PEREMANS 1950 ff.; CALDERINI 1935 ff. with later supplements. The presence of supplementary volumes clearly shows the need for continuous updates to such printed tools.

267 GAGOS 2001, 516; see below, § 9.

268 On the opposition between text linearity and tabularity see above, Introduction (§ 1.1), and VANDENDORPE 1999, *passim*.

269 An example of such an evolution of ‘traditional’ indexes are the prosopographical databases discussed in the previous chapter. ESSLER – RIAÑO RUFILANCHAS 2016, 492 refer to the “interdependence of lexica and new editions”.

270 The automated creation of word indexes is subsequent to the digital encoding of the reference text; I postpone the discussion of text encoding and computational linguistics to chapters 7–8. I am confident that this will not harm the argumentation logic because today we are so accustomed to digital texts that we take their existence for granted.

271 Since the lists are compiled from the indexes of volumes and journals, the references indicate only the volume number or the journal issue, without a precise mention of page, document number, and line. This information can be easily obtained from the actual index of that volume or journal.

272 KRETSCHMER – LOCKER 1977³ (digitized at http://digi20.digitale-sammlungen.de/de/fs1/object/display/bsb00050105_00001.html).

273 http://www.zaw.uni-heidelberg.de/hps/pap/WL/PNYU_II_Indices.pdf.

274 Cf. LUNDON 1999 on the subject.

275 LUNDON 2012.

276 LSJ is freely available at the *Perseus Project* website (<http://www.perseus.tufts.edu/hopper/text?doc=Perseus:text:1999.04.0057>) and, after free registration, at the TLG website (<http://stephanus.tlg.uci.edu/ljsj>). DGE has an open-access electronic version at <http://dge.cchs.csic.es/xdge>. Perhaps it is worth noting that the latter offers a useful function of “reverse index” for sorting the words. As a spin-off of DGE, also the updated Supplement to the *Repertorio Bibliográfico de la Lexicografía Griega* is available online (<http://dge.cchs.csic.es/blg/blg-s.htm>) and is quite a useful bibliographical resource for Papyrology too.

277 The *Glossary* appended to the *Papyrus und Ostraka Projekt Halle-Jena-Leipzig* website (<https://papyri.uni-leipzig.de/indexpage;bjsessionid=B49654404E88AA0E580DCA83559696EA?>

searchclass=glossary&XSL.lastPage.SESSION=%2Findexpage%3Fsearchclass%3Dglossary; for the project see above, § 3.6) is a reference tool for a first approach to the technical terminology of the papyri, especially those catalogued by the Project itself. It consists of a list of transliterated or modernized words (e.g. Komogrammateus, Stratege) of which a brief German explanation is given. WILLIS 1992 announced an electronic copy of Preisigke's *Wörterbuch* and *Namenbuch* to be inserted in the papyrological PHI CD-ROM (see below, § 8.3), but, to my knowledge, it has never been realized. Short lexical entries have been experimentally appended to the modern translations of some HGV entries; they are displayed in small pop-up boxes once one clicks on the corresponding term in the separate translation page linked from the main HGV record (e.g. in BGU I 4, <http://www.papy.uni-hd.de/trans/DFG/de/9088de.html>).

278 <https://oi.uchicago.edu/research/publications/demotic-dictionary-oriental-institute-university-chicago>. This dictionary strongly relies upon digital imaging to reproduce the original wordings of the terms (see below, § 5.4), but it has been published in simple PDF format, without search tools (see below, § 6.6).

279 Cf. HOFFMANN 2009.

280 Unpublished; text online at <http://www.dwl.aegyptologie.lmu.de/demotdet.php>.

281 MUÑOZ DELGADO 2001.

282 An update to this glorious lexical resource was already invoked by VAN MINNEN 1994, 40.

283 Cf. SCHOLL – WEILBACH 2016 and QUENOUILLE 2016, 14–16, for further details.

284 Cf. BABEU 2011, 53.

285 I am thankful to Roberto Mascellari for making me aware of the details of this project before its official announcement and publication.

286 <http://research.uni-leipzig.de/ddglc/docs/DDGLCBibliography.pdf>; <http://research.uni-leipzig.de/ddglc/docs/GertrudBauerCardindex.pdf>; <http://research.uni-leipzig.de/ddglc/docs.html>.

287 Cf. BONATI 2017d and 2017e.

288 A drop-down menu allows selecting the research scope: “Term” restricts the search to the headwords, “Meta-term” to the typologies/categories, “Non preferred term” to secondary headwords (diminutives, variants, etc.), “Note” to the text boxes. It is possible to search both in Latin and Greek Unicode characters.

289 Cf. <http://www.papirologia.unipr.it/CPGM>.

290 E.g. REGGIANI 2015a; ANDORLINI 2016; BONATI 2016; REGGIANI 2016; 2017c; BONATI 2017a; 2017b; 2017c; BERTONAZZI 2017a; 2017b; BONATI – MARAVELA 2018; REGGIANI 2018a; 2018b.

291 Cf. TOMSIN 1966. Later on, he also suggested how prosopographical data could be automatically extracted and indexed from computer-encoded text: cf. TOMSIN 1970a, 473. This procedure looks like an early instance of the NER (Named Entity Recognition) applied for the expansion of *TM People* (see above, § 3.3). For technical details about this first automatic prosopography cf. EVRARD 1967, 87–91. For other early projects of computerized prosopographies cf. BABEU 2011, 165.

292 Cf. <http://psi-online.it/about>.

293 Cf. STRASSI 2015 and especially FIORILLO 2015 for a detailed overview of the project history and of its technical details (in particular, the structure of the single records and the metadata considered: identity (serial unique identifier), full name (with variants), gender, chronological span of attestation, lifespan, geographical provenance, public charges, social statuses, occupations, property, slaves, family relations, textual sources, bibliography, notes).

294 The DPRE project itself is developing in collaboration with the TM editors, as STRASSI 2015 and Fiorillo 2015, 150–1 explain.

295 WAGNER 1987, vii and passim.

296 Cf. BAGNALL 1998, 545 n. 5, and see below, §§ 8.3–5.

297 Cf. <http://www.hum.leiden.edu/papyrological-institute/project-berichtigungsliste/>

[berichtigungsliste.html](#).

298 The digital retrospective conversion of BL was envisaged in 2004 (cf. BAGNALL – GAGOS 2007, 74) but the dream of an electronic BL, linked to the *Duke Databank*, dates back to 1992 (Bagnall in BAGNALL – GAGOS 2007, 63); cf. also DELATTRE – HEILPORN 2014, 321–2.

299 XP is the latest OS supported by the *Windows* version; the *Mac* version, being a *Power-PC* application, is not supported by all newer Intel-based OSX environments any more.

300 <http://hum.leidenuniv.nl/papyrologisch-instituut/project-berichtigungsliste/berichtigungsliste-der-griechischen-papyrusurkunden-aus-agypten-bl.html>.

301 From the same address as above. The poster presented at the Congress is available there too. The update issue was noticed in relation to the paper format already by BAGNALL 1998, 545.

302 BAGNALL 1995b, 1.

303 Cf. MERTENS 1961; 1964; MARGANNE 2007c; 2007e, 652–5.

304 Cf. <http://ipap.csad.ox.ac.uk/Intro.html>.

305 Cf. COCKLE 1974.

306 BAGNALL 1995b, 1.

307 GAGOS 1996, 14; cf. SCHUBERT 2009, 199.

308 BAGNALL 1995b, 1. On the topic of virtual ‘libraries’ see also above.

309 SCHOLL 2008, 32.

310 It is a private, non-profit organization acting on behalf of US libraries, archives, and universities to develop and encourage collaborative strategies for preserving and providing access to the accumulated material.

311 On digital cameras, see RUDOLF 2006.

312 “Just what is at stake here? It is not, as one might think, the access tools for such a system. Rather, it is the set of standards for the collection and storage of data. [...] Standards seem to us particularly important for imaging—not standards in the sense of imposing a single way of doing things on everyone [...], but standards in terms of seeking a common quality and technical description of the outcomes” (BAGNALL 1997, 153–4). For the technical details, see GAGOS 1997.

313 BAGNALL 1997, 153.

314 Cf. GAGOS 1996, 14–22; 1997.

315 See e.g., among the latest and most remarkable cases, the imaging of the Oxyrhynchus papyri at Oxford (cf. OBBINK 2003) and the Papyrus Projekt Halle-Jena-Leipzig (cf. SCHOLL 2008, 30–1; BLASCHEK – QUENOUILLE 2016, 36–9; see above, § 3.6).

316 Cf. MARGANNE 2007e, 655–9 (quotation from p. 655).

317 Consider also the case of the first digital pictures of the Herculeum papyri: initially they were taken by scanning analogue photographs, in order not to damage the originals; then came digitally produced images (cf. OBBINK 1997, 160–1).

318 Amongst the many possible cases, this recent annotation by Johannes Diethart, presenting some “Lesefrüchte aus PSlonline”, seems to me particularly noteworthy: “[d]er Papyrologe ist dankbar, daß er mit PSlonline und PLAUonline endlich einen angenehmen Zugriff auf passabel vergrößerbare Farbphotos einer Unzahl von in Florenz aufbewahrten Papyri bekommen hat. Dieser erfreuliche Umstand hat es mir ermöglicht, mich für einige Personennamen zu interessieren, die in der ed. pr. bzw. in DDbDP unzureichend oder falsch gelesen worden sind. Deshalb können hier zwei kleine Berichtigungen vorgestellt werden, die unser Wissen um die Onomastik des Griechischen der frühbyzantinischen Zeit in den Papyri aus Ägypten vermehren” (DIETHART 2014). GAGOS 2001, 526, refers to the advantage of digital images for proofreading the digital texts entered in the database (see below, § 8.3).

319 Cf. OBBINK 1997, 160.

320 Cf. ANDORLINI 2008, 170–1; see e.g. also OBBINK 1997, 160–1, comparing analogue and digital pictures of Herculeum papyri and noting how the latter allowed improving the readings very much. Analogue ways of enhancing the images did exist (cf. e.g. WALL 1981, again on Herculeum papyri) but were certainly more complex. Even in such a seemingly simple procedure as enlarging a digital picture we can perceive the profound benefits of digital manipulation through the words of Dorothy Thompson as reported by BOWMAN – CROWTHER – KIRKHAM – PYBUS 2008, 2: “In 1996 an important demotic papyrus from Rifeh (now housed at University College, London), was brought to the Centre for the Study of Ancient Documents (CSAD) to be scanned and digitized. Previously the text had only been readable through the use of a magnifying glass with many days spent poring over the text. Once the papyrus had been scanned, the team of papyrologists assembled in front of a computer to see what benefits digitization might bring. Far from the barely legible original, the images on screen made the ‘script come to life’ and readings and suggestions from the group flowed freely leading one of the group, Dorothy Thompson, to conclude: ‘I have seen the future and this future works – at least so far. Work in different countries on the same text at the same time can now take place without problem and for a long and difficult text, where the writing is small and faded; the possibility of working on the image on the screen is in itself a great advance’” (cf. also [http:// www.csad.ox.ac.uk/CSAD/Newsletters/Newsletter2/ Newsletter2a.html](http://www.csad.ox.ac.uk/CSAD/Newsletters/Newsletter2/Newsletter2a.html) and BOWMAN – CROWTHER – KIRKHAM – PYBUS 2010, 87–8).

321 On this issue see the technical insight by GIANI 2016.

322 Cf. BERTANI 2002 on the high-definition imaging of the Posidippus Papyrus. Electronic microscopes, of course, produce much higher enlargements (cf. e.g. THIEDE – MASUCH 1997).

323 Cf. BERTANI 2002, 17. In the edition of the Artemidorus papyrus (GALLAZZI – KRAMER – SETTIS 2008, 58), the editors stress the fact that the high-definition images attached to the volume will be of great help for further analyses on that controversial papyrus. DELATTRE – HEILPORN 2014, 324, mention the cases of the online pictures of the *ostraka* from Berenike (for O.Ber. I, <http://www.columbia.edu/dlc/apis/berenike>) and Didymoi (for O.Did., <http://www.ifao.egnet.net/bases/publications/fifao67>).

324 Cf. BLASCHEK – QUENOUILLE 2016, 49–50. For parallels, see TUPMAN 2010, 84 on 3D scan of ancient inscriptions.

325 Charge-Coupled Devices, i.e. coupled semiconductors able to accumulate electric charge in proportion to the electromagnetic radiation received.

326 Cf. ANDORLINI – MENCİ – BERTANI – CETICA – POGGI 1993 (dark papyrus); OATES – WEINBERG – SOSIN – JOHNSON 1999 (blurred text); BERTANI – CONSOLANDI 2016, 229–36. See also the detailed report of experimental imaging of carbonized papyri made by Antti Nurminen (Helsinki), *Recording, Processing and Archiving Carbonized Papyri*, at <http://www.cs.hut.fi/papyrus>, the results of which stress the great advantage of near-infrared imaging. For earlier analogue infrared photography applied to papyri see BÜLOW-JACOBSEN 2008, 175. A polemical case around seeming analogue infrared readings burst out in the Sixties: EDMONDS 1952 claimed to have found some marginal and interlinear writings in the Cairo Menander papyrus thanks to infrared photographs (never published), but further analyses rejected this ‘discovery’ (MARZULLO 1961; cf. GALIANO 1962, 593–4: “[t]odo esto es tristísimo”).

327 Cf. BÜLOW-JACOBSEN 2008, 176 ff. (case studies: dirty *ostraka*, rubbed papyrus, carbonized papyrus, darkened parchment).

328 OBBINK 1997, 161: “In the future, the different technologies will clearly have to be used in tandem”.

329 BÜLOW-JACOBSEN 2008, 185. On the subject cf. also <http://ifao.egnet.net/image/25>.

330 Posidippus: BERTANI 2001; Artemidorus: CONSOLANDI 2006. In both cases, the high-resolution colour and infrared pictures can be found also in the CD-ROM/DVD attached to the main edition of the papyri (see above, § 5.1).

331 O.S. Kamal, G. Ware, S.W. Booras, *The Petra Church Scrolls: Multispectral Imaging Techniques* (unpublished); cf. DELATTRE 2007, 179; MACFARLANE – BOORAS 2007, 421–2; BÜLOW-JACOBSEN 2008, 176. For case studies of MSI application to damaged non-papyrological objects see CAMPAGNOLO – GIACOMETTI – MACDONALD – MAHONY – TERRAS – GIBSON 2016.

332 Following earlier attempts on the Dead Sea Scrolls: cf. MACFARLANE – BOORAS 2007, 421–2. On MSI imaging of the Petra papyri cf. CHABRIES – BOORAS 2001.

333 Cf. BOORAS – SEELY 1999; STEPP – WARE 2010; also DELATTRE 2007; MACFARLANE – BOORAS 2007; MACFARLANE 2010. For the BYU Herculaneum Project see <http://guides.lib.byu.edu/c.php?g=216482&p=1429231> (“Materials related to the Herculaneum project, including digital images of the newly discovered texts, are housed in the Library’s L. Tom Perry Special Collections. These images will become part of the Library’s Digital Collections as soon as rights issues are resolved”). Cf. also <https://www.et.byu.edu/college-news/byu-adapts-space-age-technology-study-ancient-documents>.

334 Cf. the paper delivered by S.M. Bay at the 25th International Congress of Papyrology (Ann Arbor 2007), *Multi-Spectral Imaging and the Oxyrhynchus Papyri*, abstract at <https://www.lib.umich.edu/files/collections/papyrus/ICP25/Abstracts%20A-D.pdf>, p. 4; also CHABRIES – BOORAS – BEARMAN 2003; OTRANTO 2007, 468; MACFARLANE 2010, 461. For the Oxyrhynchus papyri see OBBINK 2003, 5, and the section of the *Oxyrhynchus Online* website devoted to “Recent Imaging Developments” (<http://www.papyrology.ox.ac.uk/POxy/multi/index.html>), which offers detailed descriptions of the procedure and of the results

obtained. Some pleasant Flash movies illustrate the transition of the pictures at different wavelengths.

335 ALEXOPOULOU – KAMINARI – PANAGOPOULOS – PÖHLMANN 2013. The very old Daphne papyrus is not carbonized, but it has been found in a very bad state of preservation (cf. PÖHLMANN – WEST 2012).

336 Cf. DELATTRE 2007, 180; MACFARLANE 2010, 461: it is at those wavelengths that “the reflectivity of the carbonized ink is easily distinguished from that of the carbonized papyrus”.

337 Cf. DELATTRE 2007, 180.

338 BÜLOW-JACOBSEN 2008, 176, 180–2, 184–5.

339 BAY – MACFARLANE – WAYMENT – BEARMAN 2010, 216–7 (and *passim* for further details). “High-resolution, multispectral digital imaging of important documents is emerging as a standard practice for enabling scholarly analysis of difficult or damaged texts. As imaging techniques improve, documents are revisited and re-imaged, and registration of these images into the same frame of reference for direct comparison can be a powerful tool” (BAUMANN – SEALES 2009).

340 For such a kind of analysis applied to Greek papyri cf. ANDORLINI – LUCARELLI – MANDÒ 2001.

341 Cf. LÖVESTAM – SWIETLICKI 1990; LÖVESTAM 1994.

342 For 3D modelling of *ostraka* see above, § 5.1. On scholarly 3D visualisations of cultural heritage, see in general VITALE 2016.

343 Cf. BOWMAN – BRADY – TOMLIN 1997; BOWMAN 2001; TARTE – BRADY – BOWMAN – TERRAS 2011. A web page by A. Bowman and J.M. Brady illustrates the issue and publishes some interesting images: <http://www.csad.ox.ac.uk/Stilus/Stilus.html>.

344 Cf. KOTOULA – EARL 2015. In general, on this technique and its application to ancient written artefacts see e.g. EARL – BASFORD – BISCHOFF – BOWMAN – CROWTHER – DAHL – HODGSON – ISAKSEN – KOTOULA – MARTINEZ – PAGI – PIQUETTE 2011 and PIQUETTE 2011.

345 Cf. PAL – TERRAS – WEYRICH 2013.

346 Cf. MARA – SÄNGER 2013. Online pictures of the test can be found at the Heidelberg Institute website (bottom, “Abbildungen, Mara / Sänger”): <http://www.uni-heidelberg.de/fakultaeten/philosophie/zaw/papy/projekt/projekt.html>.

347 <http://www.cs.hut.fi/papyrus/Othertests.html#stereo>: no depth differences between text and surface, only the fibre structure resulted highlighted. “Although the script isn’t lower than the background, the magnification and depth effect of a stereomicroscope helps discriminating other black marks in the background from the script. The black marks are usually caused by special surface structure, such as crevices and small cracks, and are easily identifiable with a stereomicroscope”.

348 ANDORLINI 2008, 171. Cf. also VAN MINNEN 2007, 708: “The new technology allows us to work in collections without actually being there. It also allows us to put pieces of a puzzle back together again, which would otherwise be an awkward process of waiting for photographs to arrive. By contacting relevant scholars working in collections or by browsing websites we can make joins between fragments of one and the same papyrus and establish links between related texts online, with the help of really rather simple images”.

349 This is what she masterfully did with the Ammon archive, dispersed among the Duke, Florence (Istituto “Vitelli”), and Köln papyrus collections. In the mentioned article, she describes three peculiar cases of virtual reunification: a missing small fragment joined to a bigger papyrus (P.Ammon II 30); two halves of the same document (P.Ammon II 45); several scattered scraps forming a whole text (P.Ammon II 47). For another case see e.g. HAGEDORN – POETHKE 2002 (papyrus fragments from Hamburg and Berlin, digitally reunified). I myself enjoyed editing two halves of the same Cairo papyrus, one (published) preserved at the IFAO and the other one (unpublished) from the Egyptian Museum, and took advantage of the virtual reunification of the two (REGGIANI 2014).

350 Cf. e.g. DELATTRE 2010, 207–11, for P.Herc.Paris 2, and BERTANI 2002, 17, for the

Posidippus papyrus.

351 Cf. SPARAVIGNA 2009.

352 VANNINI 2016, on the basis of PUNZALAN 2014 (who traces some general guidelines for virtual reunification of heritage collections and scattered artefacts), proposes a workflow and a digital framework for systematizing the work of virtual reunification of dispersed papyrus fragments, which of course would require a strong collaborative commitment by the holding institutions. It is particularly noteworthy her proposals of introducing a specific XML tagging (see below, § 8.5) for marking different fragments in the digital editions of reunified papyri (i.e. <milestone unit= "fragment" n=" "/>).

353 Two Oxyrhynchus samples: <http://www.papyrology.ox.ac.uk/POxy/flashy> (the second one is more difficult: it is written on both sides and needs to be turned around!). The Michigan Papyrus Collection website used to offer a similar tool for reconstructing a broken *ostrakon*, but the game seems now discontinued; one may still experience it from the *Internet Archive Wayback Machine*: <http://web.archive.org/web/20121207091746/http://www.lib.umich.edu/papyrus-collection/puzzle-1-winters-ostrakon>.

354 For example, a generalized algorithm-based solver for complex jigsaw puzzles has been described by SHOLOMON – DAVID – NETANYAHU 2014, and one may wonder whether the same technique might be suitable for papyrus fragments as well. Another option for reunifying scraps of the same papyrus is the so-called fragment siting, i.e. the physical placement of fragments according to the reconstruction of the text they bear: a nice example is given by SCHULZ 2016 (see below, § 5.4).

355 See the overview by FRÖSÉN 2009, 91 ff.

356 “Per i papiri ercolanesi non aperti, si deve oggi guardare anche a metodologie nuove che il progresso tecnico lascia intuire” (LONGO AURICCHIO 2010, 442).

357 Cf. DELATTRE 2010, 211–3.

358 SEALES 2011, 2 (and passim for further technical details). Cf. BAUMANN – PORTER – SEALES 2008.

359 Cf. SEALES – PARKER – SEGAL – TOV – SHOR – PORATH 2016, 1–5.

360 SEALES 2011, 4. A variant of this technique has been applied by an Italian team to a “realistic papyrus model” of which they managed to capture also the written characters (cf. ALLEGRA – CILIBERTO – CILIBERTO – MILOTTA – PETRILLO – STANCO – TROMBATORE 2015; ALLEGRA – CILIBERTO – CILIBERTO – PETRILLO – STANCO – TROMBATORE 2016; <http://paolociliberto.com/Publication>).

361 Cf. SEALES – PARKER – SEGAL – TOV – SHOR – PORATH 2016, 2 (passim for further technical details).

362 MOCELLA – BRUN – FERRERO – DELATTRE 2015, 2 (passim for further technical details).

363 MOCELLA – BRUN – FERRERO – DELATTRE 2015, 2.

364 Further acquisitions in this direction have been presented during the latest International Congress of Papyrology (Barcelona 2016) by Inna Bukreeva, Alessia Cedola and Graziano Ranocchia (*Virtual unrolling and deciphering of Herculean rolls by X-ray phase-contrast tomography*, abstract at <http://papyrologia.upf.edu/wp-content/uploads/book-of-abstracts.compressed.pdf>, p. 104): “[t]hanks to the exceptional properties of Synchrotron Radiation and the development of dedicated algorithms for the virtual unrolling and flattening of rolled-up papyri, it was possible to read, with unprecedented resolution and contrast, words, expressions, textual portions and a marginal sign inside PHerc. 375 and PHerc. 495” (cf. BUKREEVA – MITTONE – BRAVIN – FESTA – ALESSANDRELLI – COAN – FORMOSO – AGOSTINO – GIOCONDO – CIUCHI – FRATINI – MASSIMI – LAMARRA – ANDREANI – BARTOLINO – GIGLI – RANOCCHIA – CEDOLA 2016). A conference on “I Papiri di Ercolano tra scienza e filosofia” (Accademia Nazionale dei Lincei, Centro Linceo Interdisciplinare “B. Segre”, October 25, 2016) was subsequently devoted to various aspects of the topic (programme: http://www.lincci.it/files/convegni/1359_invito.pdf).

365 Cf. D’ALESSIO 2009.

366 In agreement with ESSLER 2008.

367 “Here again, modelling involved simplification and idealisation as it used the equation of a spiral to describe the roll – and that only will describe a perfect roll, not a skewed roll, no looseness in the roll, no folds, which all could have occurred of course. The virtual model was however helpful and showed conclusively that reordering the fragments was reasonable; and, just as with the virtual and plastic pelvis models, the physical model that I produced by printing the reconstructed papyrus based on the new fragments order served to physically convince the papyrologists by letting them manipulate an avatar of the papyrus that let them assess the appositeness of the reordering for themselves” (TARTE 2016, 108).

368 TARTE 2012, 13 (and passim for details on the study). See also below, § 5.5.

369 The papyrus has been digitized and modelled in the framework of the *Turning the Pages* project, aimed at making rare and historical medical books accessible to the public while safeguarding their physical preservation (<https://lhncbc.nlm.nih.gov/project/turning-pages>). The resources are available also in an app for *iPad*.

370 Cf. e.g. STOKES 2009; VOGELER 2009; HASSNER – SABLATING – STUTZMANN – TARTE 2014; and the sections about Digital Palaeography in REHBEIN – SAHLE – SCHABAN 2009, 135–338, and FISCHER – FRITZE – VOGELER 2010, 227–339. See also BABEU 2011, 138–41.

371 COWEY 1994, 609 (see above, § 3.1).

372 Cf. DELATTRE – HEILPORN 2014, 325.

373 Cf. MENCI 2012. A database *Greek Literary Hands of the Roman Period* is announced as forthcoming on the *PSIonline* platform (cf. <http://www.psi-online.it/about>).

374 TRACY – PAPAODYSEUS 2009: “Scholars in epigraphy, mathematics, and computer studies have collaborated to develop two methods for mapping the lettering on inscriptions

and then comparing the mapped samples to identify hands. They have successfully distinguished with 100% accuracy six hands on 23 separate fragments. This is a real breakthrough and the first time that the identification of a Greek writer has been realized via digital means. Computers offer the potential to automate the process and set the study of hands on a more objective footing” (p. 99).

375 AZZARELLO 2008.

376 *The Zooniverse* (<https://www.zooniverse.org>) is the world’s largest platform for people-powered research. Cf. BRUSUELAS 2016, 191.

377 MARTHOT-SANTANIELLO 2016; cf. http://www.papyrology.ox.ac.uk/Ancient_Lives. BRUSUELAS 2016, 189–91, stresses the role of patterns recognition in this process.

378 A strict computational pipeline captures the users’ choices as both spatial coordinates (with reference to the papyrus surface) and Unicode characters, and then processes them into ‘consensus’ transcriptions resembling closely the original format of the papyri. The results are used by the editors to check the transcriptions. Cf. WILLIAMS – WALLIN – YU – PERALE – CARROLL – LAMBLIN – FORTSON – OBBINK – LINTOTT – BRUSUELAS 2014; BRUSUELAS 2016, 193–7.

379 “The recorded shapes of individual letters invite to work on scribal handwriting recognition, in order to piece together fragments from the same text, codex, scribe, school of scrib[e]s. A starting point would be to try to put together the numerous fragments from Homer” (MARTHOT-SANTANIELLO 2016). On the fascinating prospects of storing raw Greek texts as well as unpublished fragments accessible to everyone see BRUSUELAS 2016.

380 . For a general presentation of the project see ESSLER – DAMIANI 2016.

381 See below, § 8.7; cf. AST – ESSLER 2017.

382 Cf. <http://people.csail.mit.edu/celiu/ECCV2008>.

383 From the home page. See also below, §§ 8.4 and 9.

384 “Die angestrebte Verknüpfung von Bild und Text soll in der Zukunft erlauben, aus den in der Abbildung vorhandenen Buchstaben Alphabete herauszuziehen, die selbst wiederum für paläographische Vergleiche und zur graphischen Rekonstruktion der Lücken herangezogen werden können” (again from the home page).

385 For automatic reconstruction based on quantitative text analyses see below (§ 7.1).

386 Cf. KLEVE 1975, 201–2; KLEVE 1981, 519–32; KLEVE – ORE 1984; KLEVE – ORE – JENSEN 1987; ORE 1988, 27–8; KLEVE – ORE – FONNES – CAPASSO – JENSEN – BERGERSEN 1990, 79–80 and 86–7 (here the tool’s name is spelled *Literology*); GIGANTE – CAPASSO 1990, 56–7.

387 KLEVE – ORE – JENSEN 1987, 116; KLEVE – ORE – FONNES – CAPASSO – JENSEN – BERGERSEN 1990, 80.

388 JOHNSON 1994, available online at <https://oi.uchicago.edu/research/projects/computers-graphics-and-papyrology>. On the *Chicago Demotic Dictionary* see above, § 4.2.

389 <https://www.lib.umich.edu/reading/Zenon/line01.html> and following pages.

390 Cf. BOZZI – BRESCIANI – MENCHETTI – RUFFOLO – EISENBERG – FEDELE – CORRARELLO 2002; BRESCIANI – MENCHETTI 2004; BRESCIANI – MENCHETTI – BOZZI – FEDELE 2004; GIANNOTTI – GORINI 2006; <http://www.griseldaonline.it/informatica/tecnologia-digitale-testi-demotici-menchetti.html> (with sample images). It was planned to publish the database online (cf. GIANNOTTI – GORINI 2006, 103). For earlier attempts see BETRÒ 1990; VOLPI 1990; VOLPI – SANSEVERINO 1994.

391 Cf. GIANNOTTI – GORINI 2006, 102.

392 Cf. MADERNA-SIEBEN – WESPI – KORTE 2016.

393 SCHULZ 2016.

394 Cf. TERRAS 2005.

395 Cf. TERRAS – ROBERTSON 2004.

396 The system is described in full technical and procedural details by TERRAS 2006a; cf. also TERRAS 2000; TERRAS – ROBERTSON 2005; TERRAS 2006b.

397 Cf. <http://esad.classics.ox.ac.uk>; TARTE – WALLOM – HU – TANG – MA 2009; TERRAS

- 2010, 180–2; ROUED-CUNLIFFE 2010; BABEU 2011, 115–6, 217, and 150 ff.; TARTE 2011a; 2011b.
- 398** Cf. BODARD 2007.
- 399** Cf. JOHNSON 2007, 247.
- 400** Cf. TERRAS 2011.
- 401** “I use the term ‘avatar’ here, where others might have used ‘facsimile’ or ‘surrogate’. ‘Avatar’ simply underlines that this specific remediation of the artefact only captures *some* aspect of its materiality” (TARTE 2016, 117 n. 16).
- 402** See also Tarte’s statement quoted above, § 5.3.
- 403** TARTE 2011c, 13 (and *passim* for details).
- 404** K. Piquette, *Modern Tools and Techniques for Revealing the Material World of Writing*, lecture given at the conference “Beyond Papyri: The Materiality of Ancient Texts” (Leiden, 27–29 October 2016), abstract at [http://media.leidenuniv.nl/legacy/-abstracts-conference-pap%26mat-2016-\(5\).pdf](http://media.leidenuniv.nl/legacy/-abstracts-conference-pap%26mat-2016-(5).pdf). See also TARTE 2016, 114–5, on the fundamental interplay between text and written object, and the key role of digital imaging in dealing with it.
- 405** IERANÒ 2009, 195.
- 406** Cf. KING 2014; <http://gospelofjesusswife.hds.harvard.edu>; <https://www.theatlantic.com/magazine/archive/2016/07/the-unbelievable-tale-of-jesus-wife/485573/>.

- 407** On the importance of communication in the digital classics see TERRAS 2010, 187–8.
- 408** Cf. DELATTRE – HEILPORN 2014, 308.
- 409** THOMPSON 2007, 35.
- 410** <http://www.herculaneum.ox.ac.uk/?q=papyri>; see above, § 2.5.
- 411** The Istituto “Vitelli” also produced an informative CD-ROM (ANDORLINI – BASTIANINI – MANFREDI – MENCI 2003), as an electronic enhancement of an earlier booklet (AA.VV. 1992; see above, § 3.6).
- 412** It is the case, e.g., with the website of the Department of Papyrology, University of Warsaw: the address www.papyrology.uw.edu.pl used to point to the Department web pages (cf. <http://web.archive.org/web/20080122031428/http://www.papyrology.uw.edu.pl>) but is now devoted to its papyrus collection only (see above, § 3.6).
- 413** Cf. <http://www.keme.uoc.gr/index.php/en/2016-03-09-12-38-39/departement-of-philology/287-workshop-of-papyrology-and-epigraphy>.
- 414** Cf. *Papyrology in Finland*, <http://www.helsinki.fi/hum/kla/papupetra/papyrus/finpapy.html>).
- 415** Cf. SCHOLL 2016, 2–4.
- 416** http://oi-archive.uchicago.edu/OI/DEPT/RA/ABZU/DEMOTIC_WWW.HTML#Homepages%20of%20Collections; see above, § 3.7.
- 417** <https://en.wikipedia.org/wiki/Papyrology>; the German version is somewhat more detailed: <https://de.wikipedia.org/wiki/Papyrologie>. Cf. DELATTRE – HEILPORN 2014, 310 n. 27.
- 418** QUENOUILLE 2016, 21.
- 419** MARTHOT-SANTANIELLO 2016. See also comments and interactions on the project blog, <https://blog.ancientlives.org>. “The general public was and is indeed interested in what papyrologists do. Moreover, the characters’ shapes themselves, both clear and cursive, and the random bits of ancient art visible on some papyrus fragments inspired the imagination of the volunteer community. And as the world outside academia became more informed about this vast number of papyrus fragments from Oxyrhynchus, the idea of contributing to the discovery of a lost work was a profound source of motivation. By the end of the first year of the project, AL recorded 1.5 million transcriptions, roughly 7 million Greek character classifications – currently over 9 million have been recorded” (BRUSUELAS 2016, 191).
- 420** DELATTRE – HEILPORN 2014, 325.
- 421** Cf. <https://sarajkerr.com/2014/10/11/crowdsourcing-the-ancient-lives-project>.
- 422** An estimation counts half a million fragments of Oxyrhynchus papyri preserved at Oxford, of which only 6,000 have been published so far. It would take 10,000 years to publish the rest (cf. MARTHOT-SANTANIELLO 2016). The project is flanked by a blog (<https://blog.ancientlives.org>), which provides also some introductory glimpses into Papyrology and some practical tutorials about transcribing papyri. The most relevant findings originated from *Ancient Lives* are regularly spread to the press media (see e.g. <http://www.independent.co.uk/news/science/ancient-egypt-citizen-scientists-reveal-tales-of-tragedy-unearthed-from-centuries-old-rubbish-dump-a6905541.html>).
- 423** One may note that one of the founding goals of APIS was to make papyrological metadata easily accessible to a wider non-specialist public (cf. e.g. BAGNALL – GAGOS 2007, 67): but I strongly doubt that APIS and related platforms are significantly used outside the papyrological circle.
- 424** Such a trend started far earlier than the spread of online tools. In 1992, at the 20th International Congress of Papyrology (Copenhagen), Willy Clarysse presented an instructional game, based on a shareware *HyperCard* program developed by himself and Jeroen Clarysse, in which a set of fifty questions about future were answered (in Greek) by different Greek and Egyptian gods. The application was called *Sortes of Astrampsychus* and was released together with *Ghostbuster*, *DateConverter*, and *Zenon Presentation* (see above and below, §§ 3.3, 3.7, and 7.3). Cf. KRAFT 1992, and see Appendix 1.
- 425** Some Twitter and Facebook (namely, the Michigan Papyrus Collection page: <https://>

www.facebook.com/The-University-of-Michigan-Papyrology-Collection-275678525787973) examples are mentioned by DELATTRE – HEILPORN 2014, 309–10.

426 CAYLESS 2010, 150. For the archaeological viewpoint on the impact of social web challenges cf. PERRY – BEALE 2015, the observations of which may well apply to papyrological studies as well.

427 DELATTRE – HEILPORN 2014, 324, mention S. Hagel's website at the Center for Hellenic Studies, offering a "corpus of melodies played from, among others, literary papyri", but the link is broken and I was not able to retrieve those pages anywhere else.

428 <https://www.lib.umich.edu/papyrology-collection/papyrology-online-exhibits>: *Puzzle Me This: Early Binding Fragments from the Papyrology Collection*; *From Trace to Text: Interpreting Papyrus*; *Diversity in the Desert: Daily Life in Greek and Roman Egypt*; *Breaking Ancient Seals*; *Papyrus Making 101: rediscovering the craft of making ancient paper*; *Writing in Graeco-Roman Egypt*; *Education in Ancient Egypt*; *From Papyri to King James: The Transmission of the English Bible*; *Traditions of Magic in Late Antiquity*. There is also the exhibition *Music in the Papyri* at <http://exhibitions.kelsey.lsa.umich.edu/galleries/Exhibits/MIRE/Introduction/Papyri.html>.

429 <http://www.lib.berkeley.edu/libraries/bancroft-library/tebtunis-papyri/online-exhibits>: *Readers and Writers in Roman Tebtunis*; *Ethnic Identity in Graeco-Roman Egypt*; *Religion, Magic, and Medicine in Ptolemaic and Roman Tebtunis*; *ConTexts: Graeco-Roman Egypt*; *Ancient Lives: The Tebtunis Papyri in Context*. The CTP online exhibitions have been developed to coincide with some scholarly public lectures or conferences.

430 Cf. BOTTI 2017.

431 Cf. DELATTRE – HEILPORN 2014, 308.

432 Cf. DELATTRE – HEILPORN 2014, 309.

433 Cf. DELATTRE – HEILPORN 2014, 308–9.

434 Cf. OTRANTO 2007, 465; DELATTRE – HEILPORN 2014, 309.

435 Cf. DELATTRE – HEILPORN 2014, 309, who mention Roberta Mazza's and Brice Jones' blogs, [https:// facesandvoices.wordpress.com](https://facesandvoices.wordpress.com) and <http://www.bricecjones.com> respectively; see above and below, *passim*.

436 Cf. <http://adam.igl.ku.dk/bulow/papy-l.html>; DELATTRE – HEILPORN 2014, 309.

437 GAD 2016.

438 GAD 2016, 42.

439 Text online at <http://ccat.sas.upenn.edu/rak/papyri/ebay/report-2007/report-frame.html>.

440 Resources at <http://ccat.sas.upenn.edu/rak/ppenn.html>: *The eBay Image Archive*.

441 Discussion on electronic publishing is huge and long-standing, and it does not seem worth dealing with it here. On the matter, see e.g. SCHAUDEUR 1993; KLING – MCKIM 1999; ANTELL – FOOTE – BALES FOOTE 2016; PONTE – MIERZEJEWSKA – KLEIN 2017.

442 Cf. e.g. BAND 2006.

443 Among other publications, it is worth mentioning the series *Kurzberichte aus den Papyrussammlungen* and the editions of the *Papyri Iandanae* (= P.Iand.).

444 (see above, § 4.2).

445 REGGIANI 2017a; 2017b; BONATI – MARAVELA 2018. See below, § 8.7.

446 Sel.Pap. I: <https://www.loebclassics.com/view/LCL266/1932/volume.xml>; Sel.Pap. II: <https://www.loebclassics.com/view/LCL282/1934/volume.xml>; Sel.Pap. III: <https://www.loebclassics.com/view/LCL360/1941/volume.xml>.

447 <https://www.jstor.org/journal/zeitpapyepig>; <https://www.jstor.org/journal/aegy>; <https://www.jstor.org/journal/bullamersociapapy>.

448 <https://www.degruyter.com/view/j/apf>; <http://www.brepolonline.net/loi/cde>; <http://www.libraweb.net/riviste.php?chiave=2&h=430&w=300>, respectively.

449 Cf. DELATTRE – HEILPORN 2014, 312.

450 For *Trismegistos* see above, § 3.3.

451 DEPAUW – ARLT – ELEBAUT et al. 2008; VERRETH 2009; 2011; BENAÏSSA 2012 [2009]; WÖRPER 2012; LUNDON 2012; VERRETH 2013 [2009]; BROUX 2015b.

452 BROUX – VANBESELAERE 2016. For network analysis see below, § 7.2.

453 To date only GEENS 2014, but before the creation of TOPSS (2014) other volumes had been made available via *Trismegistos* (same URL as TOP and TOPSS): VANDORPE 1988; FRANCE 1999; VERRETH 2006.

454 To date, only WOPR 2013 has been uploaded.

455 I am grateful to Graziano Ranocchia for the news about this project and its forthcoming final outcome.

456 For the Leipzig digital projects see above (§§ 3.6, 4.3, 5.1, and 6.1.

- 457 Still available at <http://www.dspace.unipr.it/ojs/index.php/Papyrotheke> and <http://www.papirologia.unipr.it/papyrotheke/papyrotheke.html>.
- 458 See <http://www.papirologia.unipr.it/papyrotheke>. Only two volumes were published: GHIRETTI 2010 and BOTTI 2010. A third volume, containing proceedings of workshops, was announced but never appeared.
- 459 Forthcoming at <http://www.trapassatoefuturo.it/ojs>.
- 460 <http://hum.leidenuniv.nl/papyrologisch-instituut/project-berichtungsliste/berichtigungsliste-der-griechischen-papyrusurkunden-aus-agypten-bl.html>, see esp. the text of the report presented at the general assembly of the Association Internationale de Papyrologues at Barcelona on August 6, 2016 by F.A.J. Hoogendijk (see above, § 4.5).
- 461 Cf. BRUNNER 1993, 10–11; DENOOZ 2007, passim.
- 462 Cf. HOCKEY 2004, 4; on computational linguistics see e.g. HAJIĆ 2004; on computational linguistics and classics see BAMMAN – CRANE 2009 and BABEU 2011, 48 ff.
- 463 MARETTI – ZARRI 1970; EVRARD 1970; BODSON 1970; TOMSIN 1970a.
- 464 MARETTI – ZARRI 1971, 11–16; cf. MARETTI – ZARRI 1970, 282 and 284–5.
- 465 We find theoretical references to lexical indexing and string searches in EVRARD 1970, 124–5; to formulaic search in TOMSIN 1970a, 475; to automatic reconstruction in TOMSIN 1970a, 472.
- 466 EVRARD 1970, 124; TOMSIN 1970a, 472.
- 467 Cf. EVRARD 1970, 124; BODSON 1970, passim; EVRARD 1971, 89 and 94.
- 468 Cf. EVRARD 1967, 94; TOMSIN 1970a, 474.
- 469 Cf. e.g. WILLIS 1984a; 1984b; 1992; see below, §§ 8.3–4.
- 470 Cf. <http://www.perseus.tufts.edu/hopper/help/quickstart#analyze>. On automatic morphological analysis in the *Perseus* digital library cf. CRANE 1998, 474 ff., and BABEU 2011, 50–2.
- 471 Cf. IDE 2004.
- 472 See details in the annotation guidelines at https://github.com/PerseusDL/treebank_data/blob/master/AGDT2/guidelines/Greek_guidelines.md; cf. MAMBRINI 2016.
- 473 On treebanking in classical studies cf. the general observations by BAMMAN – CRANE 2010; cf. also BOSCHETTI 2008; BABEU 2011, 48–50; CELANO – CRANE – MAJIDI 2016.
- 474 Cf. <http://www.dh.uni-leipzig.de/wo/projects/ancient-greek-and-latin-dependency-treebank-2-0>.
- 475 For an application to Coptic texts see ZELDES – SCHROEDER 2015.
- 476 Cf. REGGIANI 2015b and 2016c; CELANO 2017.
- 477 Cf. RIAÑO RUFILANCHAS 2014; ESSLER – RIAÑO RUFILANCHAS 2016. The annotation type is not a dependency treebank, but follows an immediate constituent analysis model, which enables relations between syntactic structure and semantic content, allows stylistic analysis, and can be converted in dependency analysis (cf. ESSLER – RIAÑO RUFILANCHAS 2016, 497–8: “The drawback of this decision is incompatibility with other existing schemas of digital annotation, at least without further coding”, p. 501). See further on, § 8.6.
- 478 Cf. RIAÑO RUFILANCHAS 1997; RIAÑO RUFILANCHAS 2006. The software allows for complex queries and exporting query results and data to other formats (cf. ESSLER – RIAÑO RUFILANCHAS 2016, 499–500).
- 479 Cf. RIAÑO RUFILANCHAS 2014, 160–1; see also ESSLER – RIAÑO RUFILANCHAS 2016, 498.
- 480 Cf. ESSLER – RIAÑO RUFILANCHAS 2016, 495.
- 481 VIERROS – HENRIKSSON 2016, 6 explain that the “original” layer does not correspond to a proper diplomatic transcription; but Evrard and Tomsin’s concept of “diplomatic edition” also is not the very same, since it involves, for example, word division.
- 482 Cf. VIERROS – HENRIKSSON 2016, passim. Detailed instructions are provided also at https://sematia.hum.helsinki.fi/docs/how_to_use.html.
- 483 Cf. VIERROS – HENRIKSSON 2016, 12.

484 “Handwriting” (description of the hand, professional level, indication of same hand), “writer and author” (names of the author of the text, of the actual writer if different, of the subscribing official, with the possibility of adding the *TM People* number), “text type” (to be selected from a drop-down menu), “addressee” (cf. VIERROS – HENRIKSSON 2016, 11–2).

485 Cf. VIERROS – HENRIKSSON 2016, 12.

486 Cf. TOUFEXIS 2010.

487 Cf. DEPAUW – STOLK 2015.

488 A recent prospective development related to linguistic annotation has been presented by Marja Vierros at the workshop “Act of the Scribe: Interfaces Between Scribal Work and Language Use” (Athens, April 6–8, 2017) with preliminary remarks on *Applying Modern Authorship Attribution Methods to Papyri and Ostraca* (abstract at <http://blogs.helsinki.fi/actofscribe/workshop>); syntactic annotation may indeed prove helpful in stylometric analyses aimed at identifying authorial hands in ancient documents and related sources. For similar applications to literary works see e.g. GORMAN – GORMAN 2016; for applications to short texts cf. SANDERSON – GUENTER 2006.

489 Cf. KLEVE 1975, 202–3; KLEVE 1981, 519; KLEVE – FONNES 1981; ORE 1988, 27–8; KLEVE – ORE – FONNES – CAPASSO – JENSEN – BERGERSEN 1990, 80–6 and 87–92; GIGANTE – CAPASSO 1990, 55–6.

490 KLEVE – FONNES 1981, 158–9.

491 BÜCHLER – HEYER – GRÜNDER 2008, 4.

492 Cf. BÜCHLER – HEYER – GRÜNDER 2008; BABEU 2011, 60–1 and 216–7; SCHUBERT 2011.

493 Cf. RÜCKER 2010; RÜCKER 2011; SCHOLL 2012.

494 Cf. BÜCHLER – KRUSE – ECKART 2012. A video demonstration of the current implementation can be viewed at http://www.e-humanities.net/lectures/SS2011/2011-DigClassSeminar/THATCamp_DevChallenge_BuechlerEckart_TextCompletion.oggv. An automated reading suggestion process is allowed also by the APPELLO web service developed as a query system for the Vindolanda database (see below, 8.6, and cf. ROUED-CUNLIFFE 2009).

495 Cf. WILLIS 1984a.

496 MICHAELSON – MOIR – MORTON 1975 (quotation from p. 120). The authors reported that more than ten years before they had already suggested the application of automatic machines to detect text matches between unidentified fragments and known texts, but had not been able to put it in practice because of the lack of any relevant digitized text *corpora* (p. 119).

497 MICHAELSON – MOIR – MORTON 1975, 120.

498 Cf. WILLIS 1984a, 163–5.

499 LEVISON 1965, 275.

500 MARTHOT-SANTANIELLO 2016, from which is taken the picture below.

501 Cf. WILLIAMS – CARROLL – WALLIN – BRUSUELAS – FORTSON – LAMBLIN – YU 2014; BRUSUELAS 2016, 197–200. Text pattern searches for unknown literary and documentary fragments are announced in the framework of the next release of the *Ancient Lives* platform: cf. MARTHOT-SANTANIELLO 2016.

502 MAGNANI 2008, 133–4.

503 Cf. RUFFINI 2008, 39.

504 For a general introduction to SNA cf. BARABÁSI 2002; RUFFINI 2008, 8 ff. For applications to ancient history, see RUFFINI 2008, 15–20 and BROUX 2015c, 707.

505 The former places each object in a space according to the levels of similarity among entities of a dataset; the latter utilizes repeated random sampling to generate draws from a probability distribution.

506 MUELLER 2003a; 2003b; 2004. In her third contribution, she combined MDS with a *Geographical Information System* (GIS) to transform the virtual settlements plotted by MDS in georeferenced locations (for Katja Mueller and papyrological applications of GIS, see

above, § 3.3). Elsewhere, she applied another type of quantitative analysis (the so-called “size-rank rule”) to establish theoretical population sizes for settlements in Ptolemaic Fayum on the basis of census data (MUELLER 2002; 2005a). Cf. RUFFINI 2008, 19–20. For *ProsPtol* see above, § 3.3.

- 507** HOFFMAN – KLIN 2006. RUFFINI 2008, 20 n. 64, interestingly notes that “[t]he appearance in the pages of *The Journal of Juristic Papyrology* of a mathematician and a computer scientist indicates the potential for cross-disciplinarity inherent in these approaches”.
- 508** MUELLER 2003a, 120. She stressed this fact also in MUELLER 2003b, 219.
- 509** RUFFINI 2007.
- 510** “The resulting chart is not a reliable guide to the physical topography of the nome” (RUFFINI 2008, 39).
- 511** RUFFINI 2008, 128–38.
- 512** RUFFINI 2008; cf. GRAHAM – RUFFINI 2007, 331–6; BABEU 2011, 168–9.
- 513** GIRGIS 1938; PRUNETI 1981.
- 514** <https://sites.google.com/site/ucinetsoftware/home>.
- 515** Cf. RUFFINI 2008, 20–8, for methodological discussion.
- 516** RUFFINI 2008, 36.
- 517** NIEMEIJER 1973, 53, quoted by RUFFINI 2008, 37.
- 518** A general overview of network terminology, with papyrological examples, is provided by RUFFINI 2008, 28–40.
- 519** <http://historicaldataninjas.com/spaghetti-monsters-al-dente>. A monograph is also forthcoming in the TOP series: BROUX – VANBESELAERE 2016.
- 520** See above, § 3.3; cf. e.g. DEPAUW – VAN BEEK 2009; BROUX – COUSSEMENT 2014; BROUX 2015a; BROUX – DEPAUW 2015a.
- 521** Cf. BROUX 2015b; 2015c; 2017; DOGAER 2015; fth.
- 522** Cf. BROUX – DEPAUW 2015b, 307–12.
- 523** Cf. DEPAUW – BROUX 2016, 208–10 (quotation from p. 210). For trend studies of papyrological scholarship through bibliography see also above, §§ 2.1–2.
- 524** Cf. BROUX 2016a and 2016b. Although basic SNA (as the one conducted in the former contribute) does not convey any information about the actual geographic location of the studied sites, “it is possible to plot sites on the basis of their coordinates as you would on a map thanks to the Geolayout algorithms in Gephi, the software used to generate networks” (BROUX 2016b, 29). The latter contribution explores this georeferencing feature, wisely concluding that “deducing geographic positions from analyses of proximity patterns, whether through MDS, network analysis or other methods, will not present straightforward results. This is not surprising, since the level of similarity between two places is measured on the basis of co-occurrence in texts, which is not necessarily defined by spatial proximity, but rather by administrative, social, religious and/or cultural ties” (BROUX 2016, 31). It is interesting the series of graphs, which shows how the view gets more distorted the more places are not georeferenced. The combination with more traditional ways for identifying actual locations is therefore highly recommended.
- 525** Dogaer presented the research project at the latest International Congress of Papyrology (Barcelona 2016) under the title *Epistolary Networks* (abstract at <http://papyrologia.upf.edu/wp-content/uploads/book-of-abstracts.compressed.pdf>, pp. 134–5). Forthcoming on the subject is DOGAER – DEPAUW 2017. Social network analysis on ancient letters has already been conducted, e.g. by CLINE – CLINE 2015 on the Amarna corpus.
- 526** BROUX 2016c, 317 (and see *ibid.*, passim for details); the first results of NER applied to Latin inscriptions will be published in BROUX fth.
- 527** BROUX 2016c; cf. DELATTRE – HEILPORN 2014, 327.
- 528** A recent critical reconsideration of SNA methods applied to papyrological research has been made by G. Ruffini, in a lecture titled *Reconsidering Network Analysis: An Evangelist’s Skepticism*, presented at the conference “Papyri & Social Networks” (Leiden 2015); abstract available at <http://media.leidenuniv.nl/legacy/abstracts-papyri-%26-social-networks-2015-def.pdf>, pp. 2–3. I was not able to attend that conference, but I am grateful to Giuditta Mirizio who kindly provided me with some relevant information about it. Ruffini pinpointed issues in the scholarly reception and in the methodology itself of papyrological SNA, based on

incomplete documentation and decontextualized data. A warning about the statistical relevance of papyri has already been given e.g. by BAGNALL 1995a, 62–4 (but see *ibid.*, 64 ff., for cases in which quantitative analyses could be successfully applied); see also the remarks by HOMBERT – PRÉAUX 1952, 40–1, and SCHEIDEL 1999, 64–5. It should be considered how new discoveries might change the picture (cf. HOFFMAN – KLIN 2006, 89). On the uneven distribution of papyrological sources see e.g. PALME 2009, 358–9.

529 MUELLER 2003b, 219.

530 GONIS 2001, 422.

531 Cf. http://www.trismegistos.org/about_how_to_cite.php. The image is reproduced in the previous page.

532 This is not purely a papyrological trend: eAQUA deals with classics in general, and see also the *Perseids* project, “a collaborative editing platform for source documents in classics” (<http://perseids.org/sites>); cf. ALMAS – BEAULIEU 2016 and see above, § 3.3.

533 BAGNALL 1998, 551 (and cf. also BAGNALL – GAGOS 2007, 65, for a similar *desideratum* expressed in 1992).

534 Cf. QUENOUILLE 2016, 11 (from which is taken the picture in the next page). It was presented at the 20th International Congress of Papyrology at Copenhagen, in 1992: see Appendix 1, below (cf. KRAFT 1992).

535 “On his [*sc.* Bennett’s] welcome page he made clear that health problems stopped him from updating it much in the last few years, and his recent death raises questions about the future of the site in the mid- to long-term: should it be at least preserved as it is? Should someone take it over, and try to update or even expand it? We do not know if he expressed his will about this, and we do not think this particular case should be discussed publicly, if not to call the scholarly community to reflect on what to do in such a situation, which is bound to happen again and again in the future” (DELATTRE – HEILPORN 2014, 328).

536 Presentation by A. Bowman at the 25th International Congress of Papyrology (Ann Arbor 2007); unpublished paper, see abstract at p. 6 of the *Proceedings*. Cf. BOWMAN – CROWTHER – KIRKHAM – PYBUS 2008 and 2010; DE LA FLOR – LUFF – JIROTKA – PYBUS – KIRKHAM – CARUSI 2010; HARLEY – ACORD – EARL-NOVELL – LAWRENCE – KING 2010; BABEU 2011, 152 ff.; and the web pages http://bvreh.humanities.ox.ac.uk/news/e-Science_Demonstrator.html and <http://bvreh.humanities.ox.ac.uk/VRE-SDM.html>, where one can find also some screenshots of the prototype. On imaging of Roman tablets see above, § 5.4.

537 EVRARD 1970, 125.

538 The wish for textual *corpora* (first thematic, then general) is recurring in Calderini’s methodological outlines that I presented in the *Introduction* above, § 1.1 (CALDERINI 1936, passim; especially CALDERINI 1951 and 1956). Cf. RUPPRECHT 1994, 25: “Die von der Epigraphik her vertraute Lösung der Herausgabe von Corpora [...] stößt im Bereich der Papyrusurkunden auf Schwierigkeiten nicht nur wegen der Zahl der edierten, sondern auch wegen des steten Zuflusses neuer Urkunden”.

539 TERRAS 2010, 50.

540 On data input and text encoding see in general LAUE 2004 and RENEAR 2004.

541 GLICKMAN 1970, 153.

542 Terminology refers to G. Genette’s textual theory (cf. GENETTE 1992, 83–4, as later developed in GENETTE 1997, 1–7).

543 Actually, with “identification labels” Glickman referred to the contextual metadata; I retain a narrower meaning, which suits my argument.

544 MELAGRAKIS 1996.

545 One of the most common is perhaps *GreekKeys*, owned and distributed by the American Philological Association (editor Donald Mastronarde). Its latest release (*GreekKeys 2015*) is free for APA members (<https://classicalstudies.org/publications-and-research/about-greekkeys-2015>; previous releases: <http://apagreekkeys.org>). Other options are described at [https://wiki.digitalclassicist.org/Greek_Keyboards_\(Unicode\)](https://wiki.digitalclassicist.org/Greek_Keyboards_(Unicode)).

546 On the architecture and the mechanics of character coding systems see MELAGRAKIS 1996 and MACRAKIS 1996 (with an excursus on the encoding issues of ancient Greek alphabets, including diacriticals).

547 Though most of the Unicode diacritics for ancient Greek come as precombined characters (i.e. the letter + its diacritics form one single character), some of them are just appended to the letter as separated, combined (or “floating”) characters. The underdot belongs to the latter group. On this issue cf. MACRAKIS 1996, 278–9.

548 See below. For example, among the newest tools we can mention the open-source *Theuth* developed by Daniele Fusi, a Word addin that helps typing in Unicode and converting any custom-encoded polytonic Greek text into Unicode (<http://fusisoft.azurewebsites.net/software/theuth>), and *Greek Transcoder*, by David-Artur Daix, a Visual Basic routine (Macro) embedded in a Word template that offers a complete range of transcoding options (<http://www.greektranscoder.org>). One has just to open the template, paste the polytonic Greek text, run the Macro, choose the appropriate typefaces, and launch the routine.

549 Cf. WILLIS 1988, 16. A strong claim to device-independency (quite interesting also because of its early appearance), especially from *Ibycus* systems, was made by ORE 1988, 28–9 (who also announced a translation of Kleve’s applications for *Lacunology* and *Literalogy* in such portable languages as *Pascal* and *Modula-2*: ORE 1988, 27–8).

550 Cf. WILLIS 1992, 125–6.

551 See above, § 1.1. It is not for fun that I ceded to the folkloric and fashionable comparison between ancient and modern media. The relationship between medium and text is a constant factor in human cultural development (cf. BOLTER 1993, 160), and text transmission issues tend to reproduce themselves: “[i]t seems therefore reasonable to argue that we have returned to a situation somewhat like the one that existed in the ancient world and furthermore that perhaps some of the processes that governed the survival of ancient works might pertain to digital media” (CAYLESS 2010, 147). Also, computer power and storage cannot be underestimated as factors influencing the digital treatment of ancient texts (cf. CRANE 2004, 50 ff.) just as ancient roll and codex capacity determined many features of analogue text processing.

552 Cf. MARGANNE 2007a, 12–13 (English version at <http://web.philo.ulg.ac.be/cedopal/papyrology-in-liege>). On the LASLA see above, §§ 3.2 and 7.1.

553 Cf. ZARRI 1967, 55; CIAMPI 1980, vii–ix.

554 Cf. EVRARD 1967, 93–4; TOMSIN 1970a, 473. We certainly remember that Tomsin’s very first attempt of applying computational algorithms to papyri involved the creation of a prosopographical database based on automatic word extraction from a digital *corpus* (see above, § 3.5).

555 Cf. EVRARD 1967, 96.

556 Nevertheless, a set of cards in which the words were encoded without accents was necessary for alphabetic sorting, as TOMSIN 1970b, 62–3 explains.

557 All words were encoded in lower case, then an automatic routine recognized those marked as proper names and capitalized their first letter (cf. TOMSIN 1970b, 62).

558 Cf. ZARRI 1967, 56–8; BINGEN 1968a, [1]; MARETTI – ZARRI 1970, 285–7; EVRARD 1970, 122–3; 1971, 90–2 (noteworthy is the consideration that it would have been better to encode all combinations of letters and diacriticals separately, if the computer memory was bigger).

559 Cf. EVRARD 1967, 93; 1968, 92; 1971, 89.

560 Cf. BINGEN 1968b, 380; BODSON 1970, 44; EVRARD 1971, 93.

561 BINGEN 1968a, [2–3]. For example, the braces for superfluous letters are replaced by double angle brackets “pour économiser deux codes dont l’utilisation était bien plus nécessaire pour rendre des sigle numériques” (TOMSIN 1970b, 61 n. 3).

562 BINGEN – TOMSIN – BODSON – DENOZZ – DUPONT – EVRARD 1968; cf. BINGEN 1968b, 379–80. Some conventions are still provisional in this volume, because it was printed quickly before the congress, as explained by BINGEN 1968b, 379. It is the case, in particular, with the numbers indicating illegible/lost characters.

563 DELATTE 1968. TOMSIN 1970a, 476 wished a progress from single test-cases to all texts as well.

564 Cf. ZARRI 1967, 57–9. The numerals *koppa* and *sampi* were transliterated with Q and V, *stigma* with the Arabic numeral 6.

565 Cf. ZARRI 1967, 71–2.

566 This, by the way, is a nice antecedent of modern ‘regularization’/‘correction’ tags in Leiden+ (see below, § 8.5).

567 Another nice antecedent of a modern tool: the automatic validating check of the *Papyrological Editor* (see below, § 8.5).

568 Cf. ZARRI 1967, 58 ff.; MARETTI – ZARRI 1970, 283–4 and 287.

569 TOMSIN – DENOZZ 1974. The technique is described in details by TOMSIN 1970c; cf. also TOMSIN 1970b, 63.

570 Cf. KEEFE 1981.

571 KEEFE 1981, 684.

572 Cf. BRUNNER 1993a; 1994; MAGNANI 2008, 128 ff.; <http://stephanus.tlg.uci.edu/history.php>.

573 BRUNNER 1994, 605.

574 BRUNNER 1994, 605–6. In BRUNNER 1984 he described in details the correct assignment of P.Dura 2, fr. A and B, to two Appian’s works, on the basis of TLG comparisons via lexical searches. In particular, it is methodologically interesting to follow the two different descriptions, of the possible manual method used by C.B. Welles to identify fr. A in 1939 and of the digital one, the search for combinations of letters and blank spaces performed with the tool *LEX*, designed by David Packard and enhanced by William Johnson to add features suitable to papyrological phenomena. Moreover, in BRUNNER 1988 he presented the case of P.Köln I 25 fr. k-o, previously assigned to *Iliad* II on the ground of the matches of the other fragments of the same papyrus, but actually not containing text strings significantly compatible with that book. See also BRUNNER 1986 and 1993b.

575 BRUNNER 1986.

576 BRUNNER 1994, 606.

577 Cf. WILLIS 1984a (see above); FORTUNA – BINDI – BOZZI 1987 (at pp. 198–203, discussion of a software designed to perform automatic comparisons between fragmentary papyri and the literary database); BOUQUIAUX-SIMON 1991; 1992 (for the TLG at Liège see also MARGANNE 2007a, 16); HANSON 1997, 300–4 (on medical fragments); HANSON 2002, 196 (apropos of Louise C. Youtie’s work on the *Michigan Medical Codex*); RENNER 2009, 290–1.

578 BRUNNER 1994, 606–7.

579 “In 1976 [...] a growing concern with papyrus texts preoccupied the advisory committee in New York. Earlier, under the guidance of past APA president William Willis, who had been

added to the membership in 1974, the committee had concurred ‘that literary papyri should be treated differently from documentary papyri, that they should be accepted as texts of ancient authors and handled together with other texts of Greek authors, and that the work of entering such texts into the data bank should be taken independently of any arrangements for documentary papyri.’ [“Minutes of the Irvine meeting of the APA Advisory Committee on the TLG (March 29–30, 1974)”] Following this advice, the TLG added numerous Greek papyrus texts to the data bank, although only edited texts would be represented, with diplomatic texts ignored altogether. [...] In order to avoid excessive duplication in the contents of the data bank, we would have to refine our thinking about papyrus texts: a distinction would have to be drawn between authors whose writings are preserved, either completely or in part, by codices, and authors whose known fragments derive entirely from papyrus and from quotations. Papyrus fragments of text supported by a manuscript tradition should be regarded as ‘alternative manuscripts,’ [quoted from “a statement by Pearson entitled ‘Fragments of Greek Authors in the Word Bank’, distributed to members of the advisory committee”, p. 1] to be treated as all other manuscripts in an apparatus criticus. Inasmuch as solutions for successful data entry of an apparatus criticus had not yet been developed, such papyrus texts were removed from the TLG’s immediate consideration. But the numerous papyrus texts that had no separate manuscript tradition would have to be represented in the data bank, and ‘generally the text to be followed will not be that of the original publication in a papyrus collection, but a critical edition of the author’s fragments.’ [“Pearson, ‘Fragments’, 2”]” (BERKOWITZ 1993, 45–6).

580 I am not speaking of metadata, of course. The first papyrological experiments, as well as the *Oxyrhynchus Computer Project* and the *Duke Databank* itself selected only ‘documentary’ texts. The first real examples of papyrological literary textual database are – significantly – the Catalogues of Mythographic and Paraliterary Papyri (CMP, CPP), launched in 2001 and 2003, respectively (see above and below, §§ 3.5 and 8.6).

581 BRUNNER 1994, 607.

582 The exact scope of the project, as defined in 1972, was “a lexicographical work which will collect, sort, and identify every single word extant in ancient Greek literary and non-literary documents” (<http://stephanus.tlg.uci.edu/history.php>). Then it was then decided to shape it as a literary textual databank. The lack of apparatus criticus is not to blame on the TLG team: “the field of Classics, asked by us to develop the principles that should underlie data entry of app. crit. materials, was not ready to provide the needed guidance” (BRUNNER 1994, 605).

583 Compare with the use of customized IBM machines at the LASLA (see above, § 8.2).

584 WILLIS 1984a, 163.

585 Cf. MAGNANI 2008, 130–1. A quick overview of Beta Code (still used for TLG e for some other resources to search for Greek text, see above, § 3.5) at <http://stephanus.tlg.uci.edu/encoding.php>. The full TLG Beta Code manual and a quick reference PDF file are available at <http://stephanus.tlg.uci.edu/encoding/BCM.pdf> and <http://stephanus.tlg.uci.edu/encoding/quickbeta.pdf> respectively.

586 Cf. OATES 1993, 69–71.

587 OCR scans, as already evoked by KLEVE – FONNES 1981, 159, proved unfeasible: “the nature of papyrological data entry is infinitely more complicated than data entry from the standard printed volume of literary texts. Finally, the almost endless varieties of typeface used in presenting papyrological volumes, ranging from the different hands of the early BGU volumes to more recent typewritten and photographed editions, precluded the use of any kind of scanner” (OATES 1993, 64). Today, discussion of OCR in relation to ancient Greek texts is mostly focused on scanning modern editions: cf. BABEU 2011, 13–14.

588 Cf. OATES 1993, 63–4; GAGOS 1996, 15; 2001, 516 n. 10 and 525–6. Proofreading was twofold: it aimed at ensuring both accuracy (by checking any possible improvements to the texts) and user-friendliness (by standardizing variants, expanding abbreviations and symbols, etc.).

589 Cf. OATES 1993, 64–5.

590 WILLIS 1984a, 169–70; cf. OATES 1993, 65 (the label {9 }9 was also used, to indicate an alternative reading from a duplicate of the same text). It is worth noting, at this stage, a sort of ‘philological’ primacy of the ‘regularized’ text, accepted in the ‘main’ text, over the actual form attested on the papyrus, relegated in the parentheses. A change in this trend has been accomplished only recently, with the development of *Papyri.info*: see below, § 8.4.

591 Cf. OATES 1993, 64–5, for full discussion of the conventions used.

592 Cf. WILLIS 1988, 16.

593 “It is not our intention [...] to duplicate or replace the printed text of published papyri but solely to record them in such a way as to be instantly searchable in whole or by category as the scholar may wish. For consultation of the texts themselves, scholars will of course continue to repair to the published editions” (WILLIS 1984a, 169); see also WILLIS 1988, 16. Again, OATES 1993, 63: “The purpose of the Duke Data Bank is to make instantly accessible through search programs the total corpus of published Greek and Latin papyri. It is not intended to substitute for printed editions but rather to serve as a means of searching such volumes and of making concordances”.

594 Cf. OATES 1993, 68.

595 WILLIS 1984a.

596 Cf. WILLIS 1988, 15; OATES 1993, 63.

597 Cf. http://lib.uci.edu/sites/all/exhibits/tlg/index.php?page=section_7; <http://stephanus.tlg.uci.edu/history.php>.

598 Cf. BOUQUIAUX-SIMON 1991, 39–41, with a description of the *Ibycus* PSC features at pp. 42–3 (see above, § 7.1).

599 Cf. WILLIS 1988, 17–18.

600 Cf. WILLIS 1992. PHI CD-ROM 2 was released in December 1988 (in the same year TLG C, the second version of the literary database, was published too).

601 Cf. OATES 1993, 71; see above, § 2.3.

602 ANDORLINI 2008, 169.

603 Cf. WILLIS 1984a, 170.

604 OATES 1993, 67.

605 Cf. QUENOUILLE 2016, 12.

606 Cf. HOCKEY 2004, 10–11.

607 Cf. WILLIS 1992, 126; OATES 1993, 65 with n. 6; WILLIS 1994, 628. A thorough comparison between *SNS Greek & Latin* and *Pandora* was developed by BÉGUIN 1995.

608 Cf. <http://smsgreek.sns.it/en/submenu-smsgreek-storia.html>. A Windows version was launched in 2004; the latest releases (6.1 for Mac, 2.1 for Windows) are dated to 2007.

609 Cf. QUENOUILLE 2016, 7–8: “Die Suche konnten die NutzerInnen der DDBDP über „Pandora“ sowohl als genaue Suche als auch als „Wildcard“-Suche gestalten und dabei bis zu drei Begriffe, die nicht aufeinander folgten, gleichzeitig eingeben (Complex Search). Dabei konnten sie entscheiden, in welcher Reihenfolge die Wörter in den Texten vorkommen mußten bzw. ob sie überhaupt vorkommen durften. Für ganze Sätze reichte hingegen die einfache Suchmaske, in der der Satz(teil) eingegeben wurde (Simple Search). Durch Anklicken der entsprechend in einer Liste erscheinenden Editionshinweisen gelangten sie auf den Volltext, in welchem das Gesuchte vorkam und markiert ausgegeben wurde. Die Ergebnisse konnten schließlich inklusive Volltext in ein Worddokument exportiert werden”. *HyperCard* was a sort of primitive hypertext application: see HOCKEY 2004, 10–11.

610 Cf. WILLIS 1994.

611 Both TLG and PHI databases on CD-ROM are largely dealt with by SCHÄFER – MEIER 2003, 8–67.

612 Cf. <http://bmcr.brynmawr.edu/2005/2005-05-07.html>.

613 https://www.tlg.uci.edu/about/cd_soft.php. Add former tools like *L-Base* and *View & Find* (cf. SCHÄFER 1993, 156–65), and *Diogenes* (see below). SCHÄFER – MEIER 2003, 67–250 (an updated version of SCHÄFER 1993), provide a detailed survey of the different programs, with a particular focus on the indexing and concordancing functions; this state of the art, of course, dates back to nearly 15 years ago.

614 <https://community.dur.ac.uk/p.j.heslin/Software/Diogenes/>; cf. QUENOUILLE 2016, 9. Its latest version (3.2.0) dates to 2007 but still works well even on *Windows 10*.

615 *Perseus* is online since 1995; it was formerly released in CD-ROM (*Perseus* 1.0 and 2.0) but in a slight different shape (mostly didactical resources). It might be nice to stress the papyrological primacy in this case: TLG (under the new direction by Maria Pantelia, as of 1996) migrated to the web with a subscribed-access version only in 2001, after producing a last CD-ROM (TLG E, 2000). For *Perseus* as hypertext see BOLTER 1991, 544.

616 See above, § 3.6, and cf. RENEAR 2014, 225 ff.

617 CRISTOFORI 2000.

618 Cf. BAGNALL – GAGOS 2007, 63–5: at the Copenhagen International Congress of Papyrology he described a “dream machine” fitting all main papyrological electronic resources (including a futuristic *Berichtigungsliste*, a digital *Wörterbuch*, prosopographical databases, even a Demotic dictionary) “into a comprehensive system of scholarly information”; BAGNALL 2012a, 2.

619 Cf. SOSIN 2010.

620 Cf. BAGNALL – JAKUB – SOSIN 2007; BABEU 2011, 217–8 and 147–8; BAUMANN – BODARD – CAYLESS – SOSIN – VIGLIANTI 2011, 28–9; BAGNALL 2012a; QUENOUILLE 2016, 20. A historical and technological sketch of the development of the papyrological databases has recently been drawn by Rodney Ast and James Cowey at the workshop “Digital Classics III: Re-thinking Text Analysis” (Heidelberg, 11–13 May 2017; proceedings forthcoming).

621 For technical details and further information cf. CAYLESS 2011 and 2013; in general on RDF cf. <https://www.w3.org/RDF> with further references. I am grateful to Hugh Cayless for advising on this.

622 Cf. BODARD – SOSIN 2011; see above, § 1.2.

623 <https://sourceforge.net/projects/epidoc/files/Transcoder>.

624 Cf. BODARD 2010, 105.

625 Some Leiden remainders were fixed during the following project phase.

626 Cf. BODARD 2010, 105–6

627 On the issues of integration cf. BABEU 2011, 147, and see above, § 3.4.

628 Particularly remarkable is the change in the display of misspellings and “regularizations”, which initially followed the practice of placing normalized/corrected forms in the text and the ancient reading in the apparatus, as a consequence of the adaptations from the old DDbDP markup (see above, § 8.3). As of September 2011, the two elements have been swapped with each other: cf. <http://digitalpapyrology.blogspot.it/2011/09/just-posted-to-papylst-dear-colleagues.html>. This required a huge effort, because the ancient reading was originally transcribed diplomatically without spirits and accents, but its inclusion in the text made it necessary to add them. This was mainly driven automatically by a script handling a large table of equivalences and with the help of the TLG morphological engine; but some remaining mess has been fixed manually over the time.

629 Cf. the IDP final report at http://www.columbia.edu/cu/libraries/inside/projects/apis/navigator/IDP1_FinalReport.pdf; see below, § 8.5.

630 BAUMANN 2013, 93. CAYLESS 2010, 146 contends that CC license, and in general open access, fosters the digital permanence of scientific publications; see below, § 9, for openness as a requisite for digital criticism.

631 Cf. QUENOUILLE 2016, 12.

632 Cf. <http://digitalpapyrology.blogspot.it/2011/09/just-posted-to-papylst-dear-colleagues.html>; <http://digitalpapyrology.blogspot.it/2011/12/papyriinfo-updates.html>; <http://digitalpapyrology.blogspot.it/2012/03/idp-updates.html>; <http://digitalpapyrology.blogspot.it/2012/04/pn-search-updates-just-posted-to-papy.html>. A useful Google Spreadsheet collects the search patterns available: https://docs.google.com/spreadsheets/d/1rCHS0f_7fR8ukMXQ9hTct8rTdCwMFYLF85xK7PyQYXQ/edit?hl=en_US&hl=en_US#gid=0.

633 It must be stressed that word proximity searches for full words; if one wants to search for any other text string, then character proximity must be used. This affects significantly the searching.

634 Regular expressions (REGEX) are formalized patterns describing certain amounts of text. They use ‘literal characters’ and ‘metacharacters’ (characters with a special meaning) to represent the text searched for. For example, given that \b indicates a ‘word boundary’ (where \ is an escape code to indicate that what follows is not a literal character), . (dot) stands for ‘any character’, { } (braces) indicate a repetition range, one can write REGEX $\alpha\tau\rho\backslash b.\{1,20\}\backslash\kappa\alpha\iota$ in the query box to search for “a string beginning $\alpha\tau\rho$ - within 20 characters of a string beginning $\kappa\alpha\iota$ ” (cf. <http://digitalpapyrology.blogspot.it/2012/03/idp-updates.html>). Complete explanations and tutorials about regular expressions, which can support even extremely complex combinations, can be found at <http://www.regular-expressions.info>.

635 Cf. <http://digitalpapyrology.blogspot.it/2012/04/pn-search-updates-just-posted-to-papy.html>.

636 This is useful if one has to search for proper names (persons, gods, places, months...), since by rule in the digital editions of papyri no word is capitalized but – indeed – proper names.

637 Sometimes, the highlight of the term(s) searched for does not work properly for some bugs not yet completely fixed.

638 Cf. <http://digitalpapyrology.blogspot.it/2011/12/papyriinfo-updates.html>.

639 Coptic characters do indeed have a dedicated Unicode subset. Previously, Coptic documentary texts were collected by the *Banque de données des textes coptes documentaires*, a.k.a. the *Brussels Coptic Database* (BCD) developed by Alain Delattre at the Université Libre de Bruxelles (<http://dev.ulb.ac.be/philo/bad/copte>; see above, § 3.3). This database was last updated in 2014. For further Coptic resources see DELATTRE – HEILPORN 2014, 324.

640 Cf. GAD 2016.

641 DELATTRE – HEILPORN 2014, 322. For now, one should refer to the Demotic texts stored in the *Thesaurus Linguae Aegyptiae* (<http://aaew.bbaw.de/tla>); see also MADERNA-SIEBEN – WESPI – KORTE 2016 (above, 5.4). A very short Demotic transcription (*Ptws*, a personal name written on the verso of P.Tebt. I 110) can be found only in <http://papyri.info/>

ddbdp/p.tebt;1;110.

642 Cf. BAGNALL 2012a, 2–3; BABEU 2011, 148.

643 Cf. <https://it.wikipedia.org/wiki/Wiki>.

644 Cf. the history sections (<http://www.stoa.org/sol/history.shtml> and <http://www.stoa.org/sol/about.shtml>) as well as MAHONEY 2009 and BAUMANN 2011.

645 Cf. <http://digitalpapyrology.blogspot.it/2011/01/idp-data-available-on-github.html>: “it represents an enabling of true community ownership of the data”. Note that, though it is possible to edit the source code via *Git* and *GitHub*, it is recommended to perform small text interventions via the *Papyrological Editor* interface: see the *Readme.md* at <https://github.com/papyri/idp.data>.

646 On both *Git* and the revision history cf. BAUMANN 2011. Cf. also BAGNALL 2012a, 5.

647 SOSIN 2010.

648 BABEU 2011, 148.

649 An “Assignments” Google spreadsheet is available online to advise about papyrological editions still missing from the database: anyone can choose a text and put his or her name to claim it for digital entering (https://docs.google.com/spreadsheets/d/1DFnkrqctcn4erxuP3_TkW-6LFQr2PW4WS0F-ys0oBNo/edit#gid=0).

650 Cf. SOSIN 2010; CAYLESS 2011; BAUMANN 2013. For a beginner’s guide to PE (updated to 2012) compiled by Paul Heilporn and others, see https://docs.google.com/document/edit?id=1w0TXTq5VuIzQxGYq9vO0CJRER3JJr6tKmwwaCzyGrXs&authkey=CKnGk_ML&hl=en#.

651 Senior editors have also been appointed for advice on the most difficult or complex cases. They are Roger S. Bagnall, Willy Clarysse, Hélène Cuvigny, Nikolaos Gonis, Dieter Hagedorn, Ann E. Hanson, Andrea Jördens, James G. Keenan, Klaas A. Worp, and formerly the late Isabella Andorlini.

652 APIS and HGV metadata can be updated or entered following the very same pipelines.

653 Cf. BAUMANN 2013, 6–10.

654 Detailed guidelines are available at http://papyri.info/docs/leiden_plus. On transcoding see BODARD – SOSIN 2011. It was effected by means of a parsing dual-syntax converter called *XSugar*, which supports conversion from both XML to Leiden+ and vice versa (<http://www.brics.dk/xsugar>).

655 In the years, the editing syntax has been improved to better respond to the users’ and the scientific needs. Among the most remarkable enhancements, we can mention the possibility to encode multiple alternative readings and ‘regularizations’ with an easier markup (cf. <http://digitalpapyrology.blogspot.it/2011/09/just-posted-to-papylis-dear-colleagues.html>; <http://digitalpapyrology.blogspot.it/2011/12/papyriinfo-updates.html>), and above all the replacement of the tag initially used to indicate misspellings (which was `|orth|` for all cases) with a more nuanced distinction between ‘regularizations’ of linguistic variants (tag `|reg|`) and simple ‘corrections’ of outright scribal mistakes (tag `|corr|`) (cf. <http://digitalpapyrology.blogspot.it/2011/03/new-in-ddbdp.html>). An interesting enhancement has also been the addition of different types of editorial corrections (BL, proposals from printed publications, proposals via PE: cf. <http://digitalpapyrology.blogspot.it/2011/12/papyriinfo-updates.html>) and the possibility of nesting several different cases into one another.

656 CAYLESS 2010, 145.

657 On the issue of the apparatus criticus in the digital editions of ancient texts see BOSCHETTI 2007; AGNESINI 2008, 114; MAGNANI 2008, 132; BABEU 2011, 158; DAMON 2016.

658 <http://www.tei-c.org/release/doc/tei-p5-doc/en/html/ref-app.html>.

659 Cf. <http://www.stoa.org/epidoc/gl/8.16/trans-erroneoussubstitution.html> (EpiDoc <choice> <corr>); <http://www.stoa.org/epidoc/gl/8.16/trans-regularization.html> (EpiDoc <choice> <reg>; <http://www.tei-c.org/release/doc/tei-p5-doc/en/html/ref-choice.html> (TEI <choice>).

660 Cf. <http://www.stoa.org/epidoc/gl/8.16/trans-ancientcorrection.html>; <http://www.tei-c.org/release/doc/tei-p5-doc/en/html/ref-subst.html>.

661 The *resp* attribute can refer to modern authors, printed bibliography, BL corrections, or PN corrections directly suggested via the Editor.

662 This markup is suggested also for all cases of iota adscript.

663 When the mistake involves an extra or a missing character, the use of Leiden brackets is recommended (e.g. $\sigma\tau\rho\alpha\tau\{\tau\}\eta\gamma\acute{o}\varsigma$, $\sigma\tau\rho\alpha\langle\tau\rangle\eta\gamma\acute{o}\varsigma$, corresponding to different EpiDoc XML codes), but a markup like $\langle\sigma\tau\rho\alpha\tau\{\tau\}\eta\langle\gamma\rangle\acute{o}\varsigma\langle\text{corr}\rangle\sigma\tau\rho\alpha\tau\tau\epsilon\omicron\varsigma\rangle$ is also suggested. It must be said that actually there is a certain degree of inconsistency, which may lead to some erroneous encoding. The main example provided, in fact, could also be encoded as $\langle\tau\langle\iota\rangle\mu\{\mu\}\eta\nu\langle\text{corr}\rangle\tau\mu\mu\eta\nu\rangle$, depending on the editor's opinion about the nature of the scribe's actual mistake.

664 Note that the original form is encoded without diacriticals.

665 BABEU 2011, 150. EpiDoc envisages the <damage> tag to indicate characters that are broken but legible (<http://www.stoa.org/epidoc/gl/8.16/trans-damaged.html>), which is different than <unclear> marking uncertain characters (<http://www.stoa.org/epidoc/gl/8.16/trans-ambiguous.html>). Such distinction is not retained in Leiden+, so that both cases tend to be encoded (as in the printed editions) with the underdot, which corresponds to the <unclear> XML tag only.

666 ROUED-CUNLIFFE 2009, [2].

667 ANDORLINI – REGGIANI 2012, 138.

668 See above, §§ 7.1 and 8.2. The 1968 AIP recommendations (above, § 1.1) also focused on indexing issues.

669 BAUMANN 2013, 105.

670 HANSON 2002; see above, §§ 1.1–2.

671 Cf. <http://digitalpapyrology.blogspot.it/2011/03/new-in-ddbdp.html>.

672 <http://papyri.info/ddbdp/ddbdp;2015;1>; <http://papyri.info/ddbdp/ddbdp;2015;2>; <http://papyri.info/ddbdp/ddbdp;2015;3>. Note the way they are recorded: since they are *descripta* and do not have any printed *editio princeps*, they have not been called after the official abbreviation P.Got., but with a progressive “ddbdp” number, which makes it clear that the papyrus has just this online edition. Cf. BERKES 2017.

673 See the project of Kathleen McNamee for creating a database of marginal annotations in literary and paraliterary papyri (MCNAMEE 1984). For Arabic papyri see already above, § 3.5

674 See e.g. the cases of collections catalogues that include also transcriptions or editions of some texts: the Spanish *Ductus* and the German *Papyrus Portal* (see above, § 3.6).

675 HUYS – NODAR 2007, 456; cf. RENNER 2009, 291; BABEU 2011, 146.

676 Cf. <http://vindolanda.csad.ox.ac.uk/tablets/TVdigital.shtml>; BABEU 2011, 146.

677 Cf. <http://vto2.classics.ox.ac.uk/index.php/about/apello-web-service>; ROUED-CUNLIFFE 2009; BABEU 2011, 151–2 and 157. APPELLO also allows for automated reading suggestions (see above, § 7.1).

678 BABEU 2011, 151.

679 Cf. VANNINI 2016 and see above, § 5.3. A digital reunified *Codex Sinaiticus* is available also through the *Turning the Pages* project of the British Library (<http://www.bl.uk/turning-the-pages>) for virtual leafing through (see above, § 5.3 as well).

680 A page of the website is devoted to their technical details.

681 Cf. BABEU 2011, 123.

- 682 We have already encountered the issues related to the digital imaging of the Herculaneum papyri: see above, § 5.3.
- 683 Cf. DEL MASTRO 2012, 176–7.
- 684 Cf. DEL MASTRO 2012, 177–8.
- 685 Cf. DEL MASTRO 2012, 179.
- 686 Access must be requested to info@cispe.org.
- 687 DEL MASTRO 2012, 181.
- 688 Cf. DEL MASTRO 2012, 180–1.
- 689 <http://www.pherc.eu/project.html>.
- 690 KOUREMENOS – PARÁSSOGLU – TSANTSANOGLU 2006.
- 691 Cf. <http://chs.harvard.edu/CHS/article/display/5418>.
- 692 Cf. http://dp.chs.harvard.edu/DP_FF_1_6.php.
- 693 One may have experienced the same feature in the *Searchable Greek Inscriptions* database by PHI, <http://epigraphy.packhum.org>.
- 694 From the transcript of his talk to the MIT LCS 35th Anniversary celebrations, Cambridge MA, April 1, 1999: <https://www.w3.org/1999/04/13-tbl.html>). See Introduction above (§§ 1.1–2).
- 695 In fact, as we saw, an exact categorization is often impossible – I should perhaps say ‘non-HGV/DDbDP papyri’.
- 696 <http://www.papyrology.ox.ac.uk/ProteusProject>, with some screenshots (reproduced here); cf. WILLIAMS – SANTARSIERO – MECCARIELLO – VERHASSELT – CARROLL – WALLIN – OBBINK – BRUSUELAS 2015.
- 697 WILLIAMS – SANTARSIERO – MECCARIELLO – VERHASSELT – CARROLL – WALLIN – OBBINK – BRUSUELAS 2015, 2.
- 698 “As the standard was designed for epigraphy, many of the standard’s XML tags and attributes provide little to no meaning in the context of papyrology and obfuscate the XML structure of a literary papyrological edition” (WILLIAMS – SANTARSIERO – MECCARIELLO – VERHASSELT – CARROLL – WALLIN – OBBINK – BRUSUELAS 2015, 2). One may note, however, that many epigraphic tags are not used at all for encoding papyri, and do not disturb the users’ work on the texts, if this is what the *Proteus* developers mean. On the other hand, the common EpiDoc ground can ensure high degrees of compatibility between cognate documents (let us just think of *Trismegistos* planning to include inscriptions, see above § 3.3).
- 699 Cf. <https://daringfireball.net/projects/markdown>; VOEGLER – BORNSCHEIN – WEBER 2014. As to now, *Markdown* lacks true standardization, contrary to XML.
- 700 Cf. WILLIAMS – SANTARSIERO – MECCARIELLO – VERHASSELT – CARROLL – WALLIN – OBBINK – BRUSUELAS 2015, 2 ff.; BRUSUELAS 2016, 201–2.
- 701 WILLIAMS – SANTARSIERO – MECCARIELLO – VERHASSELT – CARROLL – WALLIN – OBBINK – BRUSUELAS 2015, 1; cf. BRUSUELAS 2016, 201–2.
- 702 “Although plans have been announced to extend its functionality to literary papyri, we are unable to evaluate their proposed system as the application’s changes are still a work-in-progress” (WILLIAMS – SANTARSIERO – MECCARIELLO – VERHASSELT – CARROLL – WALLIN – OBBINK – BRUSUELAS 2015, 1).
- 703 Cf. AST – ESSLER 2017.
- 704 Cf. the home page of the platform and <http://isaw.nyu.edu/news/digital-literary-papyri>.
- 705 A list of the <g> types currently featured by *Papyri.info* is available at <http://147.142.225.252/paptrac/wiki/gtypes>.
- 706 Detailed discussion of this issue will be offered in REGGIANI 2018c, 2018d, and 2018e.

- 707 Cf. REGGIANI 2017c, 2017d, 2018b, 2018d, 2018e.
- 708 The encoded texts are listed at <https://goo.gl/ZBbHkp>.
- 709 Cf. <http://www.papirologia.unipr.it/ERC>. The project is mentioned at https://wiki.digitalclassicist.org/Parma_Digital_Medical_Library. See below, Appendix 2.
- 710 WILLIAMS – SANTARSIERO – MECCARIELLO – VERHASSELT – CARROLL – WALLIN – OBBINK – BRUSUELAS 2015, 2.
- 711 An interesting claim to avoid project-specific markup is advanced by MONELLA 2008 (cf. BABEU 2011, 34).
- 712 MCGANN 2012.
- 713 KEENAN 2009, 73; see the Introduction above (§ 1.1).
- 714 QUENOUILLE 2016, 21.
- 715 BAGNALL 2012b, 5.
- 716 BAGNALL 2012b, 2.
- 717 BAGNALL 2012b, 4.
- 718 From the opening speech of the workshop “Editing Papyri On Line”, Parma, April 20, 2011.
- 719 “There are nearly as many papyrologies as there are papyrologists, and they are numerous” (BINGEN 1977, quoted by KEENAN 2009, 72). See also above (§ 1.2).
- 720 Cf. BAGNALL – GAGOS 2007, 62.
- 721 SCHUBERT 2009, 199.
- 722 Digital palaeographical resources are being developed on the literary side too, where for the moment paper resources still are the only means.
- 723 Cf. SCHUBERT 2009, 212.
- 724 CALDERINI 1936, 352.
- 725 BAGNALL – GAGOS 2007, 63.
- 726 Cf. VAN MINNEN 1994, 41. CALDERINI 1936, 355 used a military metaphor to describe the growing number of edited papyri: “E in realtà il gran numero di papiri che continuamente escono, possono paragonarsi ad un esercito di piccole unità”.
- 727 See the stylus tablets case discussed earlier, where the papyrologists’ work has been monitored and then “translated” into automated algorithms: “[t]his tool [...] model[s] the tacit knowledge and working processes of papyrologists as well as learn from their behavior in order to expedite their daily work and make suggestions in future work” (BABEU 2011, 154; cf. *ibid.*, 154–5). In a sense, also the “raw material” collected and stored by *Ancient Lives* (cf. BRUSUELAS 2016, 200) is nothing else than the first stage of the papyrological workflow.
- 728 GAGOS 2001, 516. LAMÉ 2014 has described this idea (with reference to ancient epigraphs) through Foucault’s philosophical concept of *dispositive*: the message of the text-bearing object can be completely understood in relation with a complex network of many other heterogeneous pieces of information. The ultimate purpose is “to digitize also the network that connected those information systems, instead of digitizing each individually”.
- 729 BARTHES 1981, 39. GAGOS 2001, 515 n. 8 noted that “[t]his ‘intertextuality’ of the text is what G. Genette would call ‘transtextuality’ [GENETTE 1992]. It is not, perhaps, accidental that postmodern theories on language and ‘text’ developed more or less at the same time with the spread of the electronic media”.
- 730 GAGOS 2001, 514–6.
- 731 Cf. WARWICK 2014.
- 732 DEGANI 1992; cf. MAGNANI 2008, 135–7. For a fair (and early!) comparison between print and electronic tools, cf. BAGNALL – GAGOS 2007, 59–62. The objections against computerization of the resources have been outlined (and effectively answered) by BAGNALL 2012a, 8 ff.: they involve not only quality and quality control, but also branding and possessiveness, and economic considerations. Sustainability is the key concept advanced by Bagnall to face all concerns, and the current technological infrastructure offered by *Papyri.info* seems to satisfy that requirement.
- 733 BODSON 1970, 44.

734 KLEVE – FONNES 1981, 165 (recovering KLEVE 1975, 202–3, and citing CRÖNERT 1930, 144).

735 One naturally may blame that the *Duke Databank* is not always consistent in treating misspellings and consequent ‘regularizations’, but should not expect absolute exactness from printed editions. I recently dealt with the case of iotacism in the word *hermen(e)ia*: I found several inconsistencies in the online databank (and subsequently submitted fixing proposals), but similar inconsistencies are to be found in the printed editions as well, which after all are the ultimate sources of the digital collection (cf. REGGIANI 2017d and 2018e). The same applies, for example, to the shortcomings in digital metadata recently pinpointed by CASANOVA 2015.

736 CAPASSO 2005, 235–6.

737 GAGOS 2001, 515 n. 8.

738 Cf. BOLTER 1991 for striking observations about hypertext as a new writing space, to which one has to adapt the text.

739 BAGNALL – GAGOS 2007, 74. Similarly PURPURA 2001, 5 (“i problemi sono oggi connessi alla difficoltà di abbandonare rapidamente radicati atteggiamenti connessi all’opera cartacea”) and ROMANELLO – BERTI – BOSCHETTI – BABEU – CRANE 2009, 165 (“Once we are able to overcome the physical limits of printed editions by joining together variants and conjectures referring to the same texts, it also becomes possible to look at the texts from a new and broader perspective, with possible consequences for our knowledge and comprehension of them”). See also CAYLESS 2010, 148: “perhaps emphasis on technology that faithfully replicates the printed appearance of documents is misplaced”.

740 OWENS 2011.

741 Cf. HANSON 2002, 196; SCHUBERT 2009, 197.

742 Cf. HANSON 2002, *passim*; SCHUBERT 2009, 212–3.

743 The concepts of “liquid modernity” and “liquid society” have been theorized by Zygmunt Bauman, emphasizing the fact of change in the modern times (cf. e.g. BAUMAN 2000; 2007; 2011).

744 If we imagine papyrological ongoing research as a river stream, we must admit that what in the past took ages to flow from – say – the *editio princeps* to the *Sammelbuch*, then to scholarly discussion and perhaps some emendation to be recorded in the *Berichtigungsliste*, and then eventually to a possible new edition of the text, now takes just the time of submitting the updated SoSOL file to the PE editorial board and waiting for their judgement.

745 <http://www.papyrology.ox.ac.uk/ProteusProject>.

746 *Mutatis mutandis*, this is what LAMÉ 2014, 3 calls “paper browsers”, i.e. digital dispositives that allow one “to mimic the work of the reader in a library”. Such digital editorial platforms as PE and *Proteus* essentially mimic the traditional philological work. I am of course eager of testing the working Oxford platform, but at any rate the preview screenshots do show a very traditional structure featuring text, apparatus criticus, etc.

747 Cf. <http://digitalpapyrology.blogspot.it/2011/03/new-in-ddbdp.html>: “we have taken the first major steps toward bringing the DDbDP’s apparatus criticus conventions more closely into line with current practice” (see also above, § 8.4).

748 Cf. BODARD – GARCÉS 2009, 92–6.

749 Cf. REGGIANI 2017d; STOLK 2017; see above (§ 7.1).

750 Cf. REGGIANI 2017d, 2018d, and 2018e.

751 For further theoretical and practical problems involved by a full digital apparatus criticus cf. DAMON 2016.

752 Cf. REGGIANI 2017e.

753 Cf. WEST 1998.

754 Cf. DUÉ – EBBOTT 2009; DUÉ 2010; NAGY 2010; SMITH 2010; BABEU 2011, 36–9.

755 Cf. BIRD 2010.

756 BODARD – GARCÉS 2009, 96 n. 31.

757 On the multiversion document model see also SCHMIDT 2010.

758 The expression is borrowed from BOLTER 1991. It is worth recalling the interesting observation by CAYLESS 2010, 162, that traditional commentary is a hypertext in print (see also *ibid.*, 170).

759 BABEU 2011, 214.

760 BODARD – GARCÉS 2009, 96.

761 An ontology is a formal definition of types, properties, and interrelationships of the entities belonging to a certain domain of knowledge. In other words, it compartmentalizes the variables needed for some set of computations and establishes the relationships between them.

762 ROMANELLO – BERTI – BOSCHETTI – BABEU – CRANE 2009.

763 ROMANELLO – BERTI – BOSCHETTI – BABEU – CRANE 2009, 158.

764 On the analogy between literary fragments and papyrological fragments see REGGIANI 2015b, 347, and 2016c, 3.

765 ROMANELLO – BERTI – BOSCHETTI – BABEU – CRANE 2009, 160 and 162.

766 For annotation layers of linguistic variants see above (§ 7.1), apropos of *Sematia*. BOZZI 2006 establishes a fundamental distinction between simple electronic publishing and “computational digital philology”, which defines a system involving “the strict interaction among data, information tools and personal competence of the editor” (p. 11), capable of storing all relevant information (text, apparatus, digital pictures), arranging it in a network of modules, including dynamic indexes and concordances, possible alignments between text and image, as well as variant fields structured as “an omni-comprehensive apparatus [...] for the creation of a positive apparatus where all the witness readings, including those he himself has accepted in the critical text, will be contained” (p. 15). Such a system might produce a large variety of critical editions, from the traditional printed ones to online hypertexts, depending on the way in which the different modules are arranged and interconnected. Experiments have been conducted also to apply this “digital philology system” (DIPHILLOS) to the edition of papyrus texts: see BOZZI 2003; BOZZI – RAGGIOLI 2004; BOZZI 2009. Cf. recently BOZZI 2014.

767 Cf. <http://www.tei-c.org/Activities/Council/Working/tcw19.html>; PIERAZZO 2008.

768 CRIBIORE 2017: see in particular the case of the medical *Anonymus Londinensis*. From the computational viewpoint, cf. MACÉ – BARET – BOZZI – CIGNONI 2006 (in particular, PASSAROTTI 2006). Genetic criticism can be applied to some documentary categories which show a certain complexity of textual composition. One may recall, just for instance, the legal documents of Ammon’s archive, produced in multiple versions (P.Ammon II), the mostly neglected cases of duplicates recently ‘rediscovered’ by Malcolm Choat and Rachel Yuen-Collingridge (YUEN-COLLINGRIDGE – CHOAT 2012), and Raffaele Luiselli’s considerations about authorial revisions in Roman letters and petitions (LUISELLI 2010). Giuditta Mirizio (Bologna) is currently working on this topic also from the perspective of digital encoding and XML annotation.

769 REGGIANI 2017b will be a more detailed insight on the proposed topics.

770 For the non-linearity of the digital space see above, Introduction, and BOLTER 1993, 163.

771 Klaas Bentein (Ghent) has recently applied the concept of ‘multimodality’ as the integration of different modes of variation (e.g. VAN LEEUWEN 2005) to the analysis of the social meaning of documentary papyri, on occasion of the workshop “Act of the Scribe: Interfaces Between Scribal Work and Language Use” (Athens, 6–8 April 2017; proceedings forthcoming).

772 Cf. REGGIANI 2018e. BODARD – GARCÉS 2009 argue that a major advantage of digital editions (namely the papyrological ones) is the possibility to get back to the materiality of texts, avoiding the philological necessity of reconstructing an archetype and focusing on text transmission instead. “[A]ttention would be better focused on how to present a text with multiple manuscript witnesses to a reader in a digital environment” (BABEU 2011, 36): “Digital editions may stimulate our critical engagement with such crucial textual debate. They may push the classic definition of the ‘edition’ by not only offering a presentational

publication layer but also by allowing access to the underlying encoding of the repository or database beneath. Indeed, an editor need not make any authoritative decisions that supersede all alternative readings if all possibilities can be unambiguously reconstructed from the base manuscript data, although most would in practice probably want to privilege their favoured readings in some way. The critical edition, with sources fully incorporated, would potentially provide an interactive resource that assists the user in creating virtual research environments” (BODARD – GARCÉS 2009, 96). “Thus, the authors hop[e] that digital or virtual research environments would support the creation of ‘ideal’ digital editions where the editor does not have to decide on a ‘best text’ since all editorial decisions could be linked to their base data (e.g., manuscript images, diplomatic transcriptions)” (BABEU 2011, 36). Similarly, NICHOLS 2009 states that the ideal of the archetype text and textual criticism is an “artefact of analogue scholarship” consequent to the limitations of the printed pages. Conversely, “[t]he Internet has altered the equation by making possible the study of literary works in their original configurations. We can now understand that manuscripts designed and produced by scribes and artists – often long after the death of the original poet – have a life of their own. It was not that scribes were ‘incapable’ of copying texts word-for-word, but rather that this was not what their culture demanded of them. [...] [I]t requires rethinking concepts as fundamental as authorship, for example. Confronted with over 150 versions of the work, no two quite alike, what becomes of the concept of authorial control? And how can one assert with certainty which of the 150 or so versions is the ‘correct’ one, or even whether such a concept even makes sense in a pre-print culture” (NICHOLS 2009). “Thus, the digitization of manuscripts and the creation of digital critical editions have not only provided new opportunities for textual criticism but also might even be viewed as enabling a type of criticism that better respects the traditions of the texts or objects of analysis themselves” (BABEU 2011, 39). Consider also the reflections of CAYLESS 2010 about the prominence of the transmission of content on its external appearance, already mentioned above (§ 8.5): “[p]agination is a relatively fragile construct in the digital age”, and textual “accretions” like commentaries, glosses and marginal notes, progressively gathered around the main text in its historical transmission, can be effectively encoded and represented in digital editions that not simply replicate print technologies (*ibid.*, 148). Quite interestingly, Cayless’ picture exactly parallels the arguments brought by HANSON 1997 apropos of the transmission of ancient medical fragmentary texts, and the “accretive model of composition” (e.g. p. 305) that she envisages to overcome the limits and rigidities of stemmatological interpretations.

773 OWENS 2011; cf. TARTE 2011c, 1. On the critical outcome of computational tools see also the notion of “algorithmic criticism” as outlined by RAMSAY 2011.

774 We should stress the not secondary feature of open access of the papyrological source data (for this feature of *Papyri.info* see above, §§ 8.4–5), in the light of the striking opinion expressed by BODARD – GARCÉS 2009, that a digital edition is ‘critical’ also thanks to the openness of its data, so that the editorial background is always accessible and checkable by anyone. In Papyrology, openness means (also) collaboration: “[w]e do not really know what the future of digital papyrology holds. But if we want to move ahead intelligently and carefully, I think there are a few measures that we can take. Especially in an age of flagging institutional support: We must collaborate. We must share the workload. We must use common technical standards. We must do our work in the full sunlight of the web, and not in the black box of anonymity. We must leverage the strength of our community’s distinguishing spirit of collegiality” (SOSIN 2010). Open collaboration makes all interpretative decisions both transparent and accessible, according to the system deployed by *Papyri.info* and DCLP and described above (§§ 8.5–6). For general statements about collaboration in digital editions see ROBINSON 2010; on openness cf. also MONELLA 2008.

775 On network as an interpretive help cf. BOLTER 1993, 163–4.

776 VAN MINNEN 1994, 41.

777 ANDORLINI – REGGIANI 2012, 139.

778 Cf. ANDORLINI 1995 and 2017b; REGGIANI 2017f and 2017g.

779 Cf. ANDORLINI 1997. At the end of 1997, a digital archive of texts and pictures on CD-ROM (in collaboration with the TLG editors) was envisaged to be appended to the printed volumes of the *Corpus*. In an unpublished early presentation of the project, which I very recently happened to find among her papers, Professor Andorlini wrote: “nella prospettiva di realizzazione di questo progetto [...] si prevede di corredare la pubblicazione dei volumi del Corpus dei Papiri Medici di un supporto CD dove possano essere registrati sia un archivio di testi (Ann Hanson è in contatto a questo scopo con i curatori del CD della letteratura greca oggi in uso), sia un archivio di immagini dei papiri pubblicati nei volumi”.

780 ANDORLINI 1997, 19–20.

781 Cf. ANDORLINI 1997, 20–4.

782 ANDORLINI 1997; 2001; 2004; 2009; ANDORLINI – HANSON 2017.

783 Main reference website: <http://www.papirologia.unipr.it/ERC>.